The Harman Kardon Model hk460i

AM/FM/Stereo FM Solid State Receiver

Technical Manual

harman/kardon

PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.

2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.

3. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the original type.

4. If one output transistor burns out (open or short) always remove all the output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.

5. When mounting a replacement power transistor, be sure that the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, for they may cause transistor failure.

6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

7. Fuses must be replaced with size and type indicated. Use of other types can expose components to destructive current levels.

ALIGNMENT PROCEDURES

AM ALIGNMENT

Instruments: 1. AM Signal Generator modulated with 400Hz at 30%.
2. Oscilloscope
3. AC V.T.V.M.

Notes: 1. Set function selector switch to AM position.
2. Connect signal source to a loop placed to radiate signals into AM antenna loop stick (L251).

Step	Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
1	455kHz	VTVM and oscilloscope to TP1 and ground	Quiet point on band	T251, T252, T253	Maximum output on VTVM and at the same time clean wave form on oscilloscope
2	540kHz	Same as above	540kHz	L252	Same as above
3	1600kHz	Same as above	1600kHz	TC252	Same as above
4	Repeat steps 2 and 3 for optimum sensitivity				
5	600kHz	VTVM and oscilloscope to TP1 and ground	Tune for signal	L251	Maximum output on VTVM and at the same time clean wave form on oscilloscope
6	1400kHz	Same as above	Same as above	TC251	Same as above
7	Repeat steps 5 and 6 for optimum sensitivity				

ALIGNMENT PROCEDURES

FM ALIGNMENT

Instruments:
1. FM Signal Generator modulated with 1000Hz at 100% (75kHz).
2. Center Zero Meter
3. Distortion Meter
4. AC V.T.V.M.

Notes:
1. Set function selector switch to FM position.
2. Set muting switch to OFF (button in) position.
3. Connect signal source to FM antenna terminals.
4. Set signal weak to obtain an exact tuning point when tuning.

Step	Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
1		VTVM to tape out jack	Quiet point on band	T101	Maximum noise on VTVM
2		Center zero meter to TP2 and TP3	Same as above	T201(A)	Indicating "0" on center zero meter
3		VTVM to tape out jack	Same as above	T201(B)	Minimum noise on VTVM
4	88MHz 6dBf (1μV)	Same as above	88MHz	L105	Maximum output on VTVM
5	108MHz 6dBf (1μV)	Same as above	108MHz	TC103	Same as above
6	Repeat steps 4 and 5 for optimum sensitivity				
7	90MHz 6dBf (1μV)	VTVM to tape out jack	Tune for signal	L102, L103	Maximum output on VTVM
8	106MHz 6dBf (1μV)	Same as above	Same as above	TC101, TC102	Same as above
9	Repeat steps 7 and 8 for optimum sensitivity				
10	98MHz 65dBf (970μV)	Distortion meter to tape out jack	Tune for signal	T201(B)	Minimum reading on distortion meter
11	Repeat step 2 (DC balance adjustment) once again.				

MUTING SENSITIVITY ADJUSTMENT

Instruments:
1. FM Signal Generator modulated with 1000Hz at 100% (75kHz).
2. AC V.T.V.M.

Notes:
1. Set function selector switch to FM position.
2. Set muting switch to ON (button out) position.
3. Connect signal source to FM antenna terminals.
4. Turn VR355 to clockwise fully.

Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
98MHz 30dBf (16μV)	AC VTVM to tape out jack	98MHz	VR355	Turn VR355 to counter-clockwise till needle deflection on VTVM

ALIGNMENT PROCEDURES

STATION LOCK AND SIGNAL STRENGTH INDICATORS ADJUSTMENT

Instrument: FM Signal Generator modulated with 1000Hz at 100% (75kHz).

Notes:
1. Set function selector switch to FM position.
2. Connect signal source to FM antenna terminals.
3. Set signal weak to obtain an exact tuning point when tuning.

Step	Signal Source	Dial Setting	Adjust	Adjust For
1	98MHz 24dBf (8μV)	98MHz	VR354	"1" of signal strength display LEDs lights
2	98MHz 16dBf (3μV)		VR201	Station lock indicator LED lights
3	98MHz 85dBf (9.7mV)		VR352	All signal strength display LEDs lights
4	Repeat step 1 once again.			

MPX ADJUSTMENT

Instruments:
1. FM Signal Generator modulated with 1000Hz at 100% (75kHz).
2. Frequency Counter

Notes:
1. Set function selector switch to FM position.
2. Connect signal source to FM antenna terminals.

Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
98MHz 65dBf (970μV)	Frequency Counter to TP4 and ground	98MHz	VR302	76kHz

STEREO FM INDICATOR ADJUSTMENT

Instrument: FM Stereo Signal Generator modulated with 1000Hz at 100% (75kHz).

Notes:
1. Set function selector switch to AUTO FM position.
2. Connect signal source to FM antenna terminals.
3. Set main signal ON and pilot signal (9%) ON of FM stereo signal generator.

Signal Source	Dial Setting	Adjust	Adjust For
98MHz 36dBf (30μV)	98MHz	VR353	Stereo FM indicator LED lights to just light

ALIGNMENT PROCEDURES

SEPARATION ADJUSTMENT

Instruments: 1. FM Stereo Signal Generator modulated with 1000Hz at 100% (75kHz).
(L + R = 45% L − R = 45% 19kHz = 9%)
2. AC V.T.V.M.

Notes: 1. Set function selector switch to AUTO FM position.
2. Set blend control to STEREO position.
3. Connect signal source to FM antenna terminals.
4. Set signal weak to obtain an exact tuning point when tuning.

Step	Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
1	Set Lch signal ON at FM stereo signal generator				
2	98MHz 65dBf (970μV)	VTVM to Rch tape out jack	98MHz	VR301, VR303	Minimum output on VTVM
3	Set Rch signal ON at FM stereo signal generator				
4	98MHz 65dBf (970μV)	VTVM to Lch tape out jack	98MHz	VR301, VR303	Minimum output on VTVM

IDLING CURRENT ADJUSTMENT

Instrument: DC V.T.V.M.

Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.

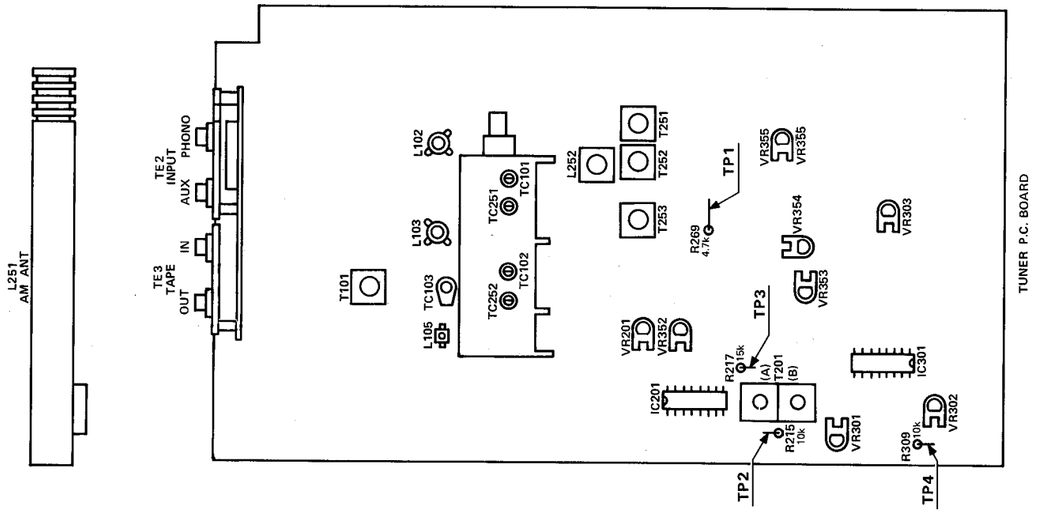
Step	Connect Output Meter To	Adjust	Adjust For
1	DC VTVM to TP5(+) and TP6(−)	VR404	33mV
2	DC VTVM to TP7(+) and TP8(−)	VR403	33mV

DC VOLTAGE BALANCE ADJUSTMENT

Instrument: DC V.T.V.M.

Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.
3. Press in speaker 1 push button to ON (button in) position.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC VTVM to Lch terminal of speaker system 1	VR402	0V ±60mV
2	DC VTVM to Rch terminal of speaker system 1	VR401	0V ±60mV



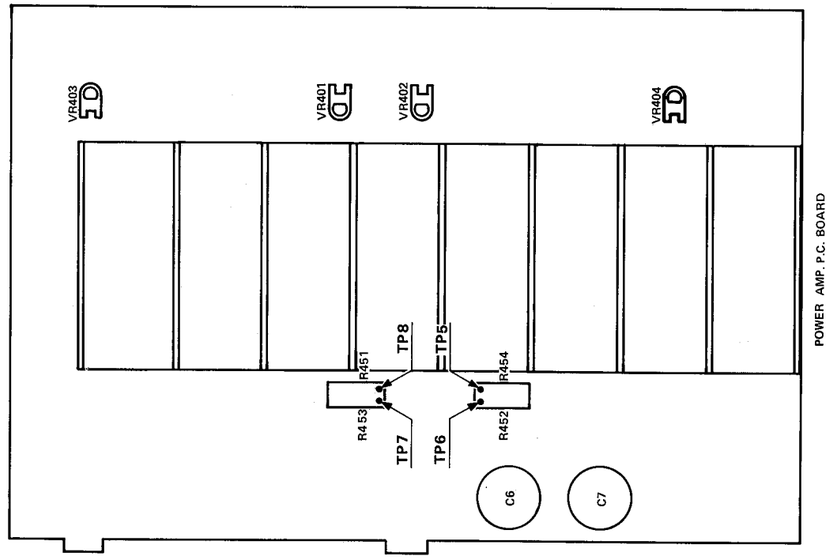


Fig. 1 – Alignment Points Location

ALIGNMENT PROCEDURES

SEPARATION ADJUSTMENT

Instruments: 1. FM Stereo Signal Generator modulated with 1000Hz at 100% (75kHz).
(L + R = 45% L − R = 45% 19kHz = 9%)
2. AC V.T.V.M.

Notes: 1. Set function selector switch to AUTO FM position.
2. Set blend control to STEREO position.
3. Connect signal source to FM antenna terminals.
4. Set signal weak to obtain an exact tuning point when tuning.

Step	Signal Source	Connect Output Meter To	Dial Setting	Adjust	Adjust For
1	Set Lch signal ON at FM stereo signal generator				
2	98MHz 65dBf (970μV)	VTVM to Rch tape out jack	98MHz	VR301, VR303	Minimum output on VTVM
3	Set Rch signal ON at FM stereo signal generator				
4	98MHz 65dBf (970μV)	VTVM to Lch tape out jack	98MHz	VR301, VR303	Minimum output on VTVM

IDLING CURRENT ADJUSTMENT

Instrument: DC V.T.V.M.

Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC VTVM to TP5(+) and TP6(−)	VR404	33mV
2	DC VTVM to TP7(+) and TP8(−)	VR403	33mV

DC VOLTAGE BALANCE ADJUSTMENT

Instrument: DC V.T.V.M.

Notes: 1. Set function selector switch to AUX position.
2. Set volume control to minimum position.
3. Press in speaker 1 push button to ON (button in) position.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC VTVM to Lch terminal of speaker system 1	VR402	0V ±60mV
2	DC VTVM to Rch terminal of speaker system 1	VR401	0V ±60mV

ALIGNMENT PROCEDURES

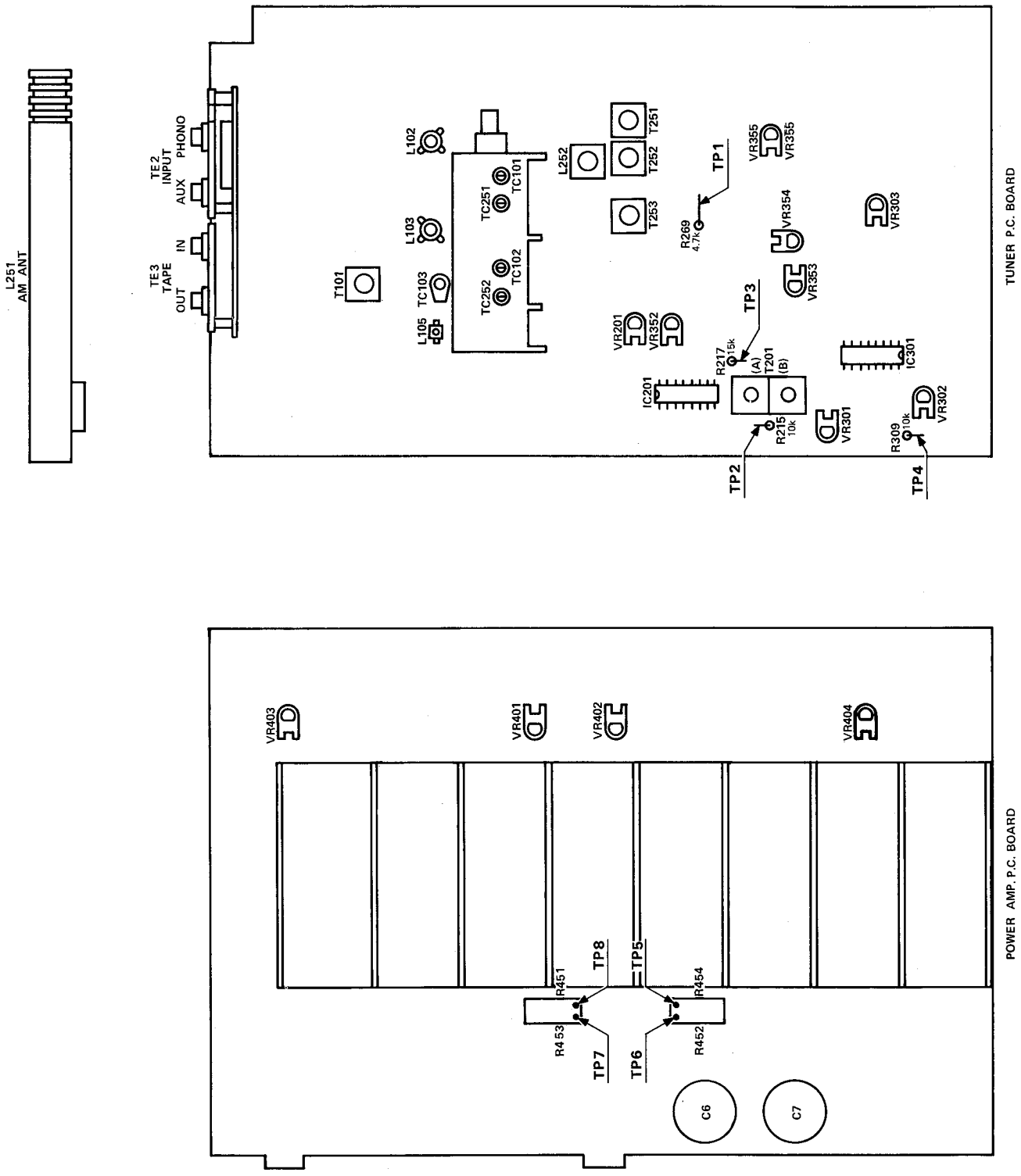
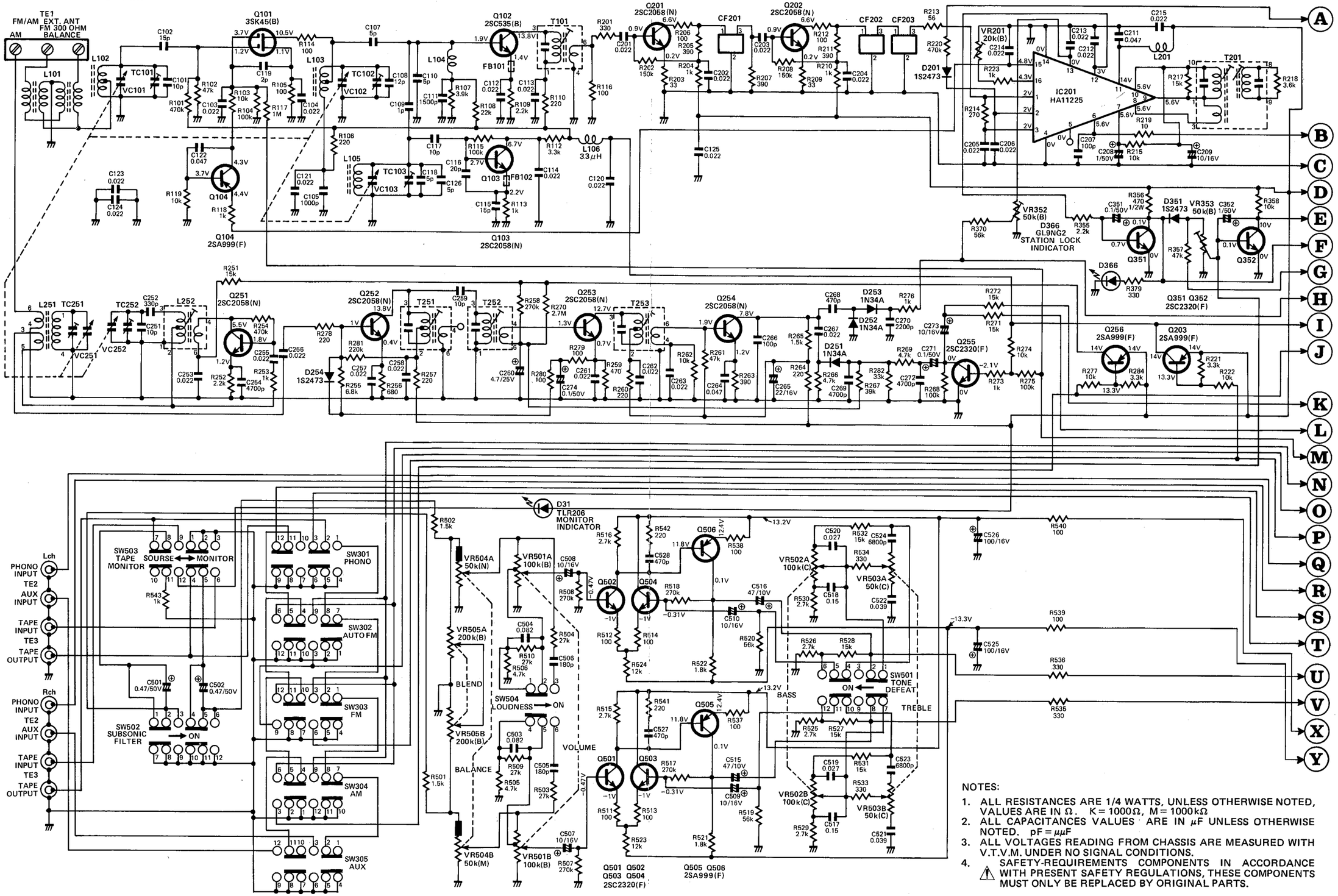


Fig. 1—Alignment Points Location

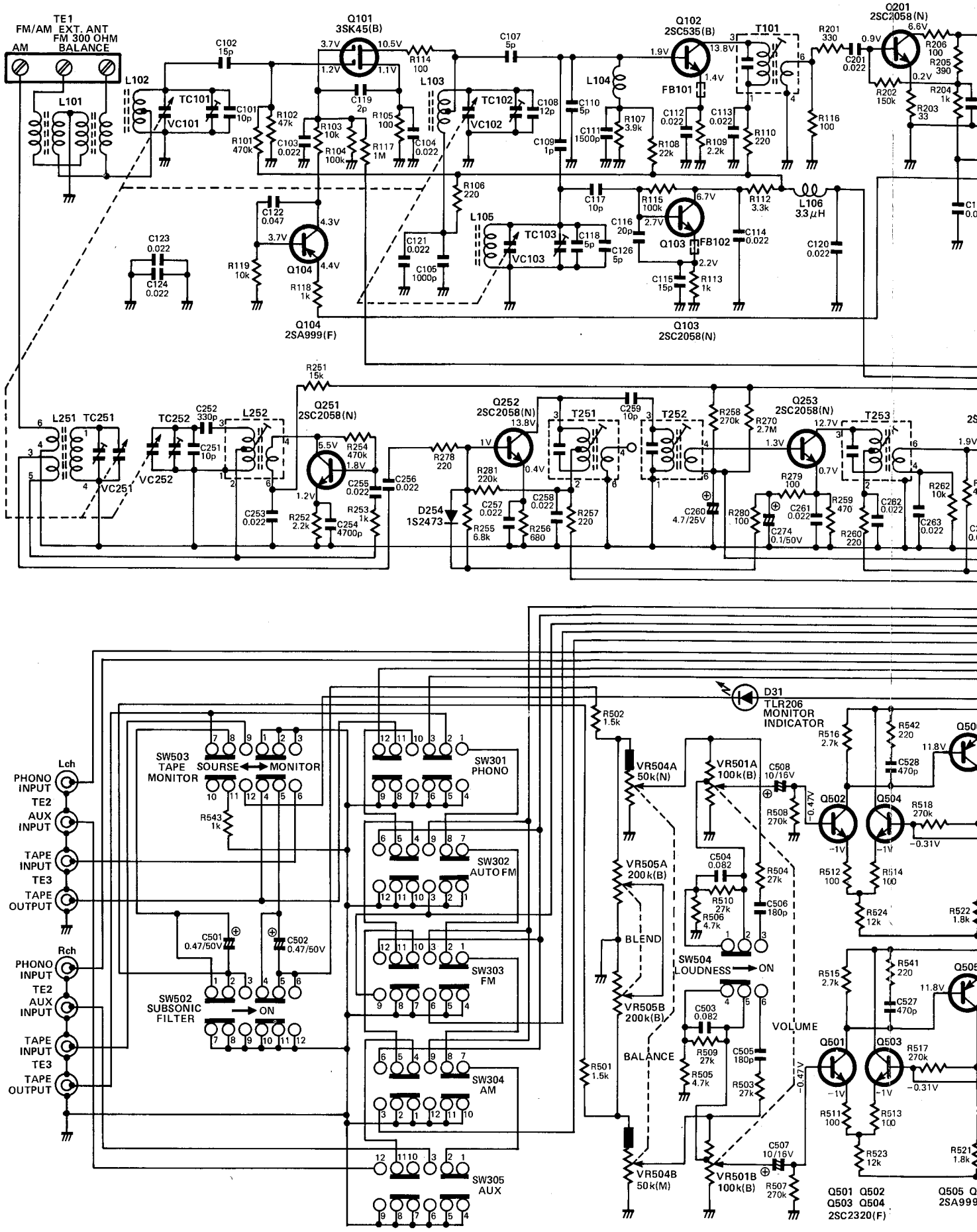
SCHEMATIC DIAGRAM

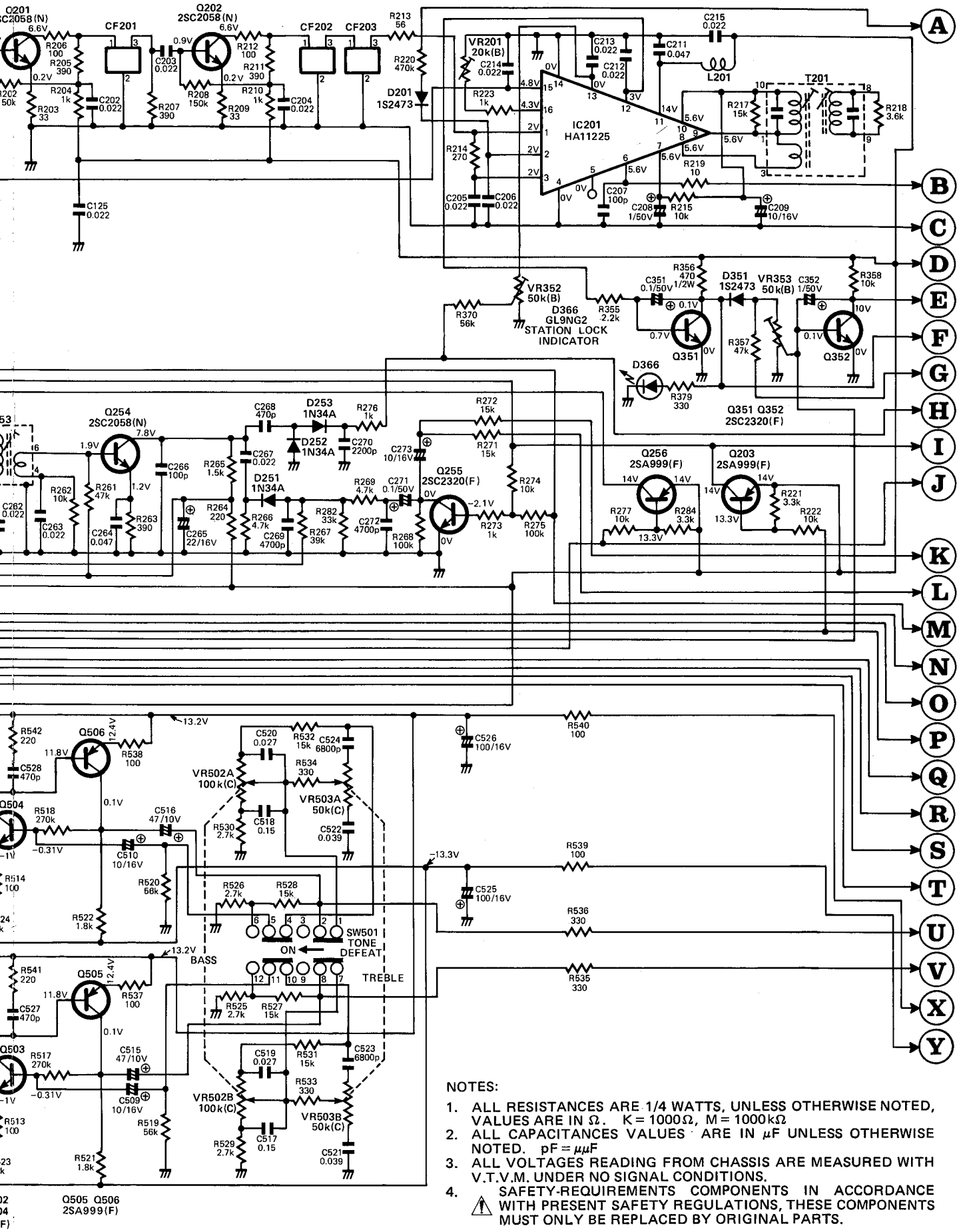


NOTES:

1. ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω. K = 1000Ω, M = 1000kΩ
2. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF = μμF
3. ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
4. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

SCHEMATIC DIAGRAM





NOTES:

1. ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω. K = 1000Ω, M = 1000kΩ
2. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF = μμF
3. ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
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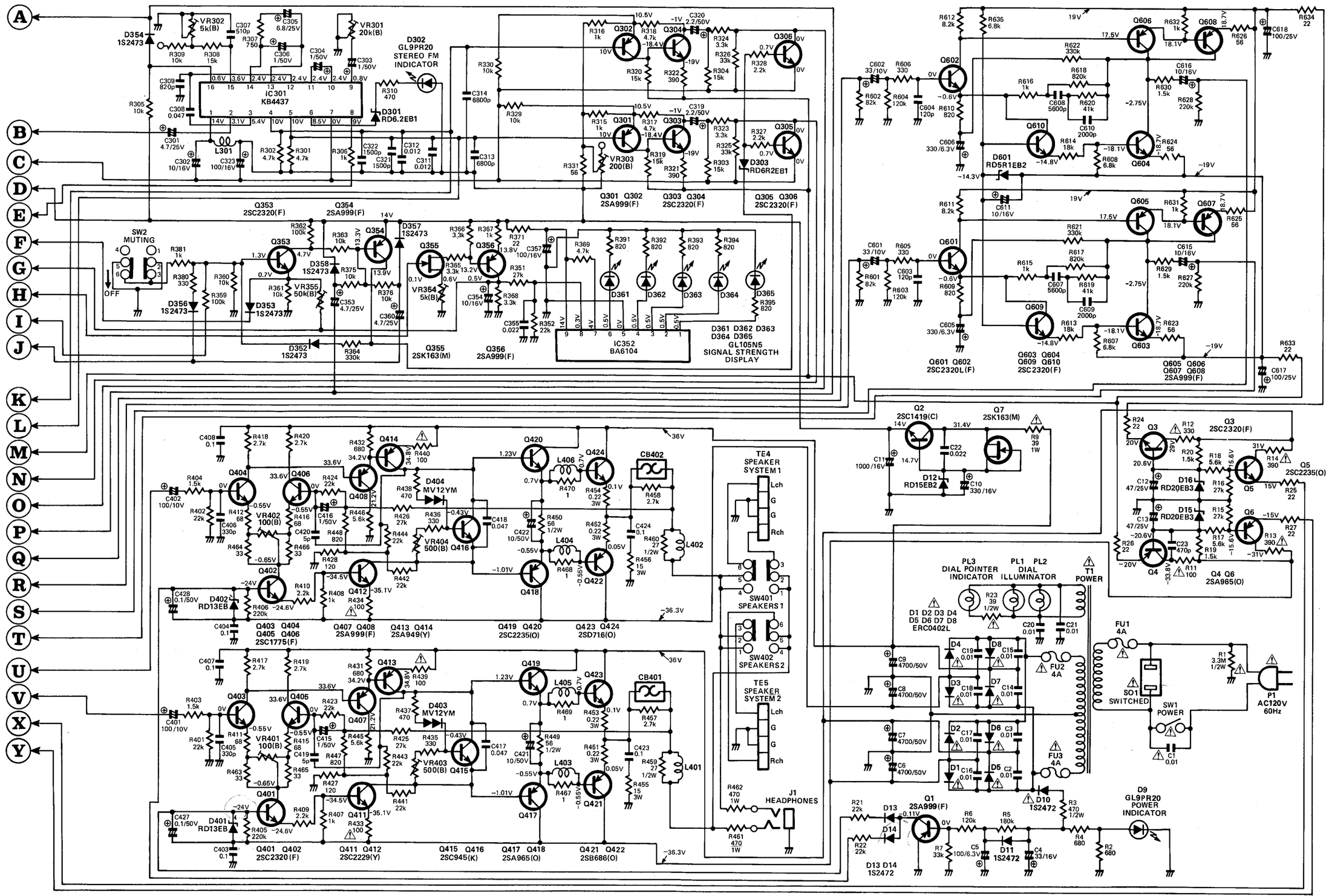
SCHEMATIC DIAGRAM



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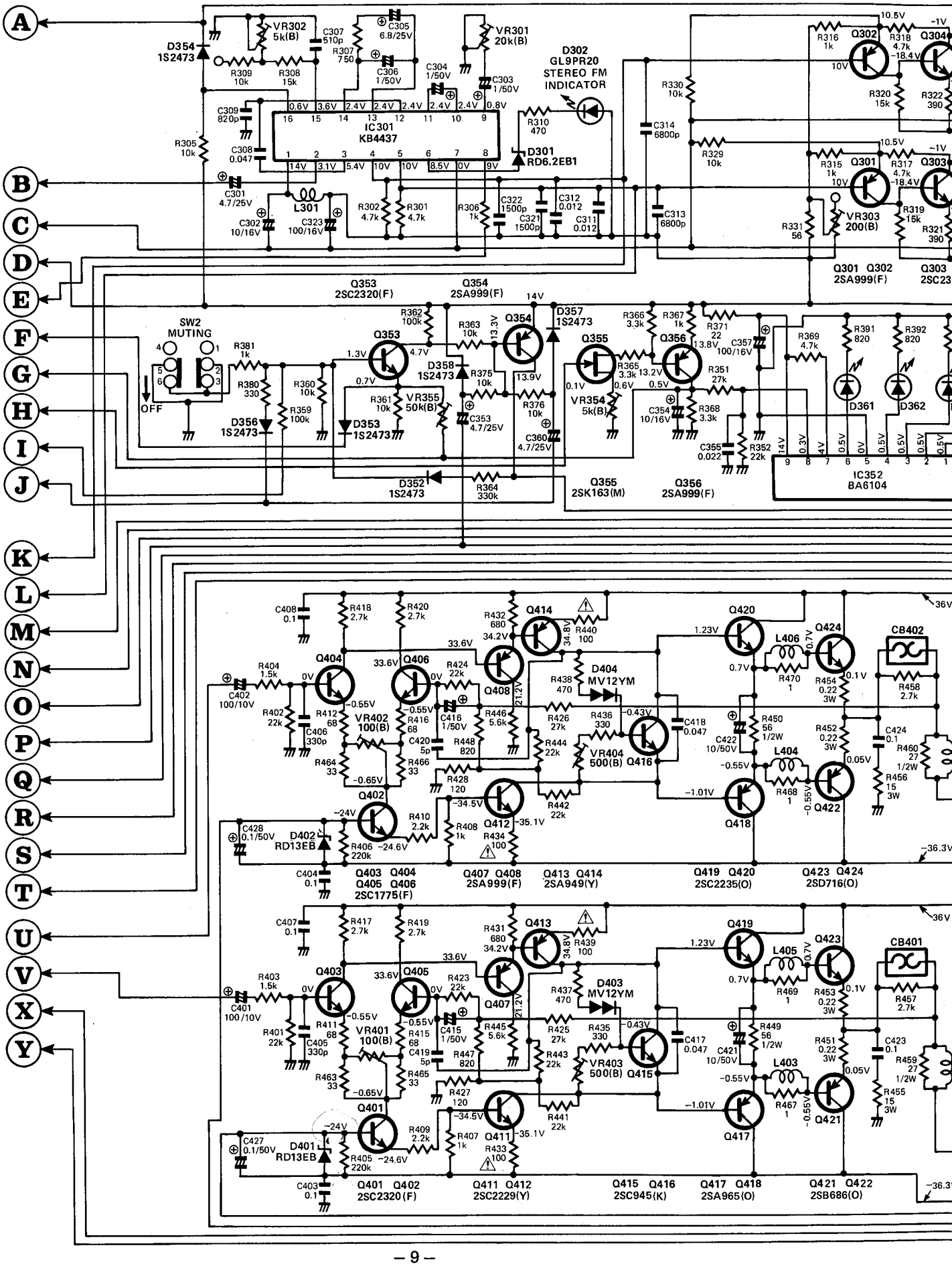
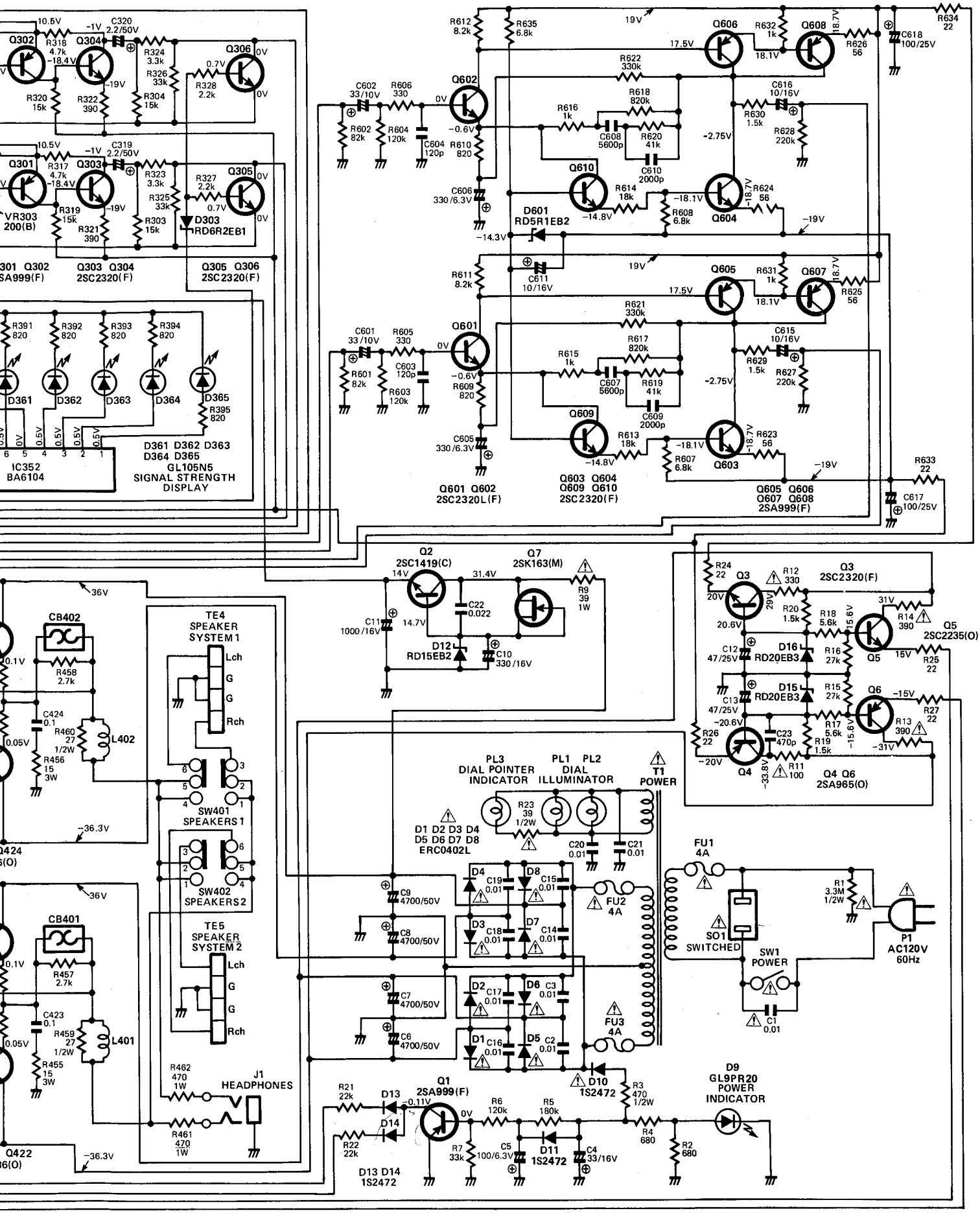
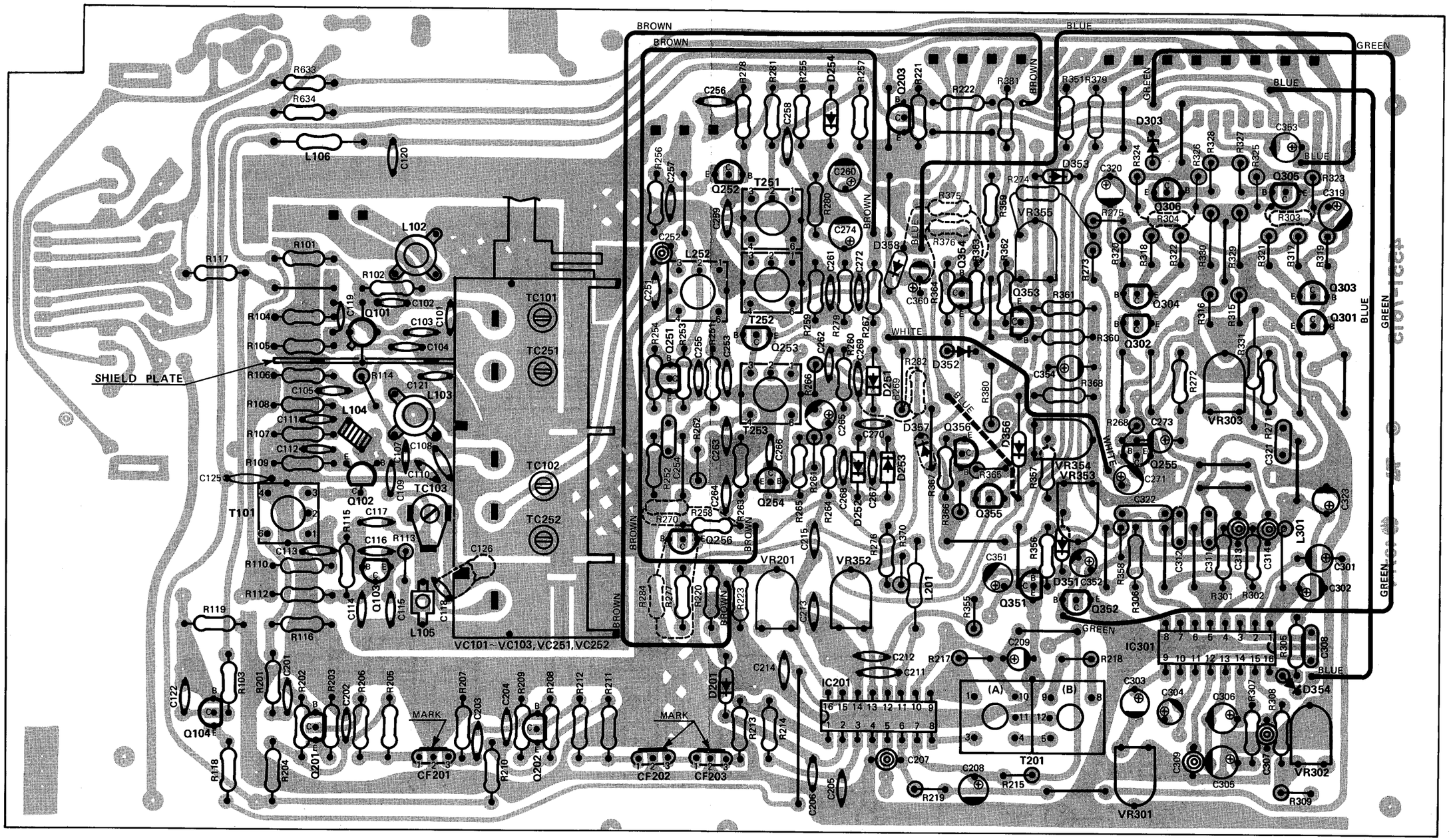
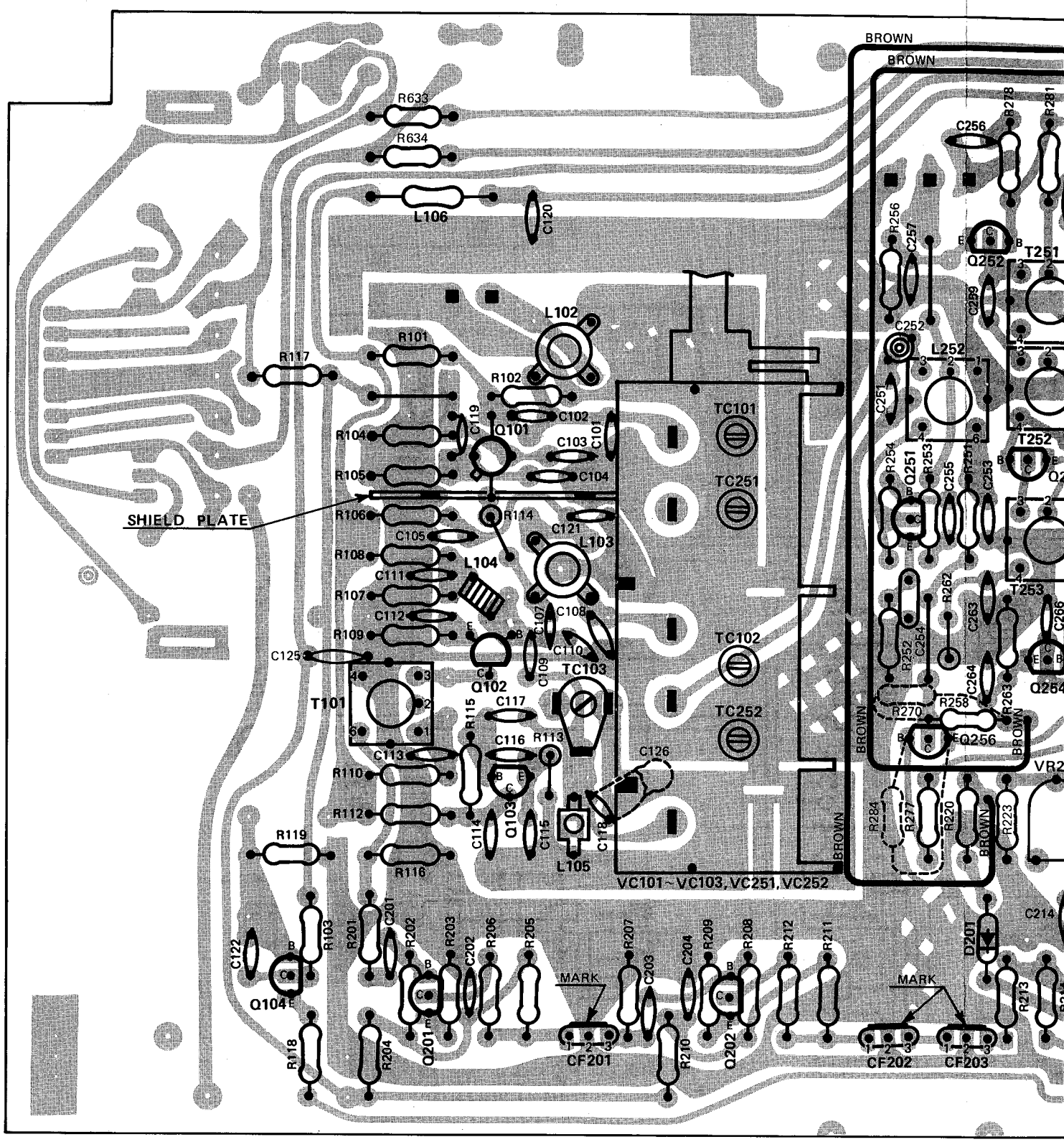


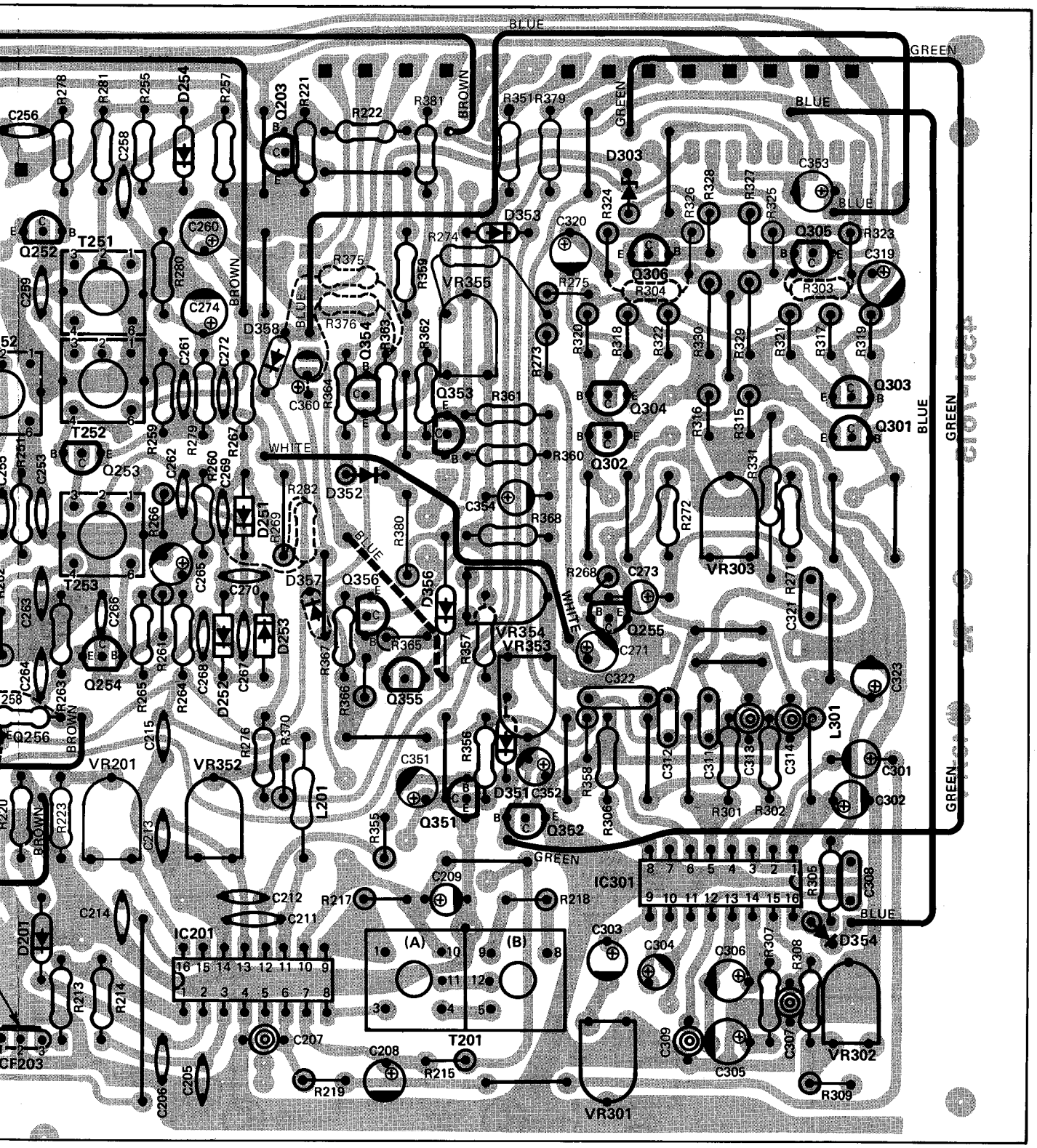

Q302
Q304
Q306
Q301
Q303
Q305
VR303
200(B)
Q301 Q302
SA999(F)
Q303 Q304
2SC2320(F)
Q305 Q306
2SC2320(F)
D303
RD6R2EB1
Q606
Q608
Q602
Q610
Q604
D601
RD5R1EB2
Q605
Q607
Q601
Q609
Q603
Q601 Q602
2SC2320L(F)
Q603 Q604
Q609 Q610
2SC2320(F)
Q605 Q606
Q607 Q608
2SA999(F)
D361
D362
D363
D364
D365
IC352
BA6104
D361 D362 D363
D364 D365
GL105N5
SIGNAL STRENGTH
DISPLAY
Q2
2SC1419(C)
Q7
2SK163(M)
D12
RD15EB2
Q3
2SC2320(F)
Q5
2SC2235(O)
D16
RD20EB3
D15
RD20EB3
Q6
Q4
Q4 Q6
2SA965(O)
CB402
CB401
TE4
SPEAKER
SYSTEM 1
TE5
SPEAKER
SYSTEM 2
Lch
G
G
Rch
SW401
SPEAKERS 1
SW402
SPEAKERS 2
L402
L401
J1
HEADPHONES
PL3
DIAL POINTER
INDICATOR
PL1 PL2
DIAL
ILLUMINATOR
T1
POWER
D1 D2 D3 D4
D5 D6 D7 D8
ERC0402L
FU1
4A
FU2
4A
FU3
4A
SO1
SWITCHED
SW1
POWER
P1
AC120V
60Hz
Q1
2SA999(F)
D10
1S2472
D11
1S2472
D13 D14
1S2472
D9
GL9PR20
POWER
INDICATOR

TUNER P.C. BOARD



TUNER P.C. BOARD




BLUE
GREEN
BROWN
WHITE
Q252
Q253
Q254
Q256
Q255
Q203
Q351
Q352
Q353
Q354
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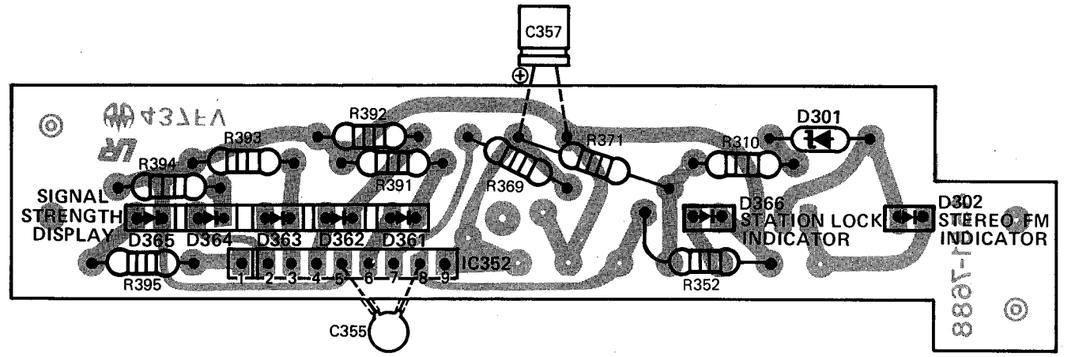
Q356
Q301
Q302
Q303
Q304
Q305
Q306
T251
T252
T253
T201
D254
D303
D353
D358
D352
D357
D356
D253
D251
D252
D201
D351
D354
VR201
VR352
VR355
VR354
VR353
VR303
VR301
VR302
L201
L301
IC201
IC301
CF203
(A)
(B)

TUNER P.C. BOARD

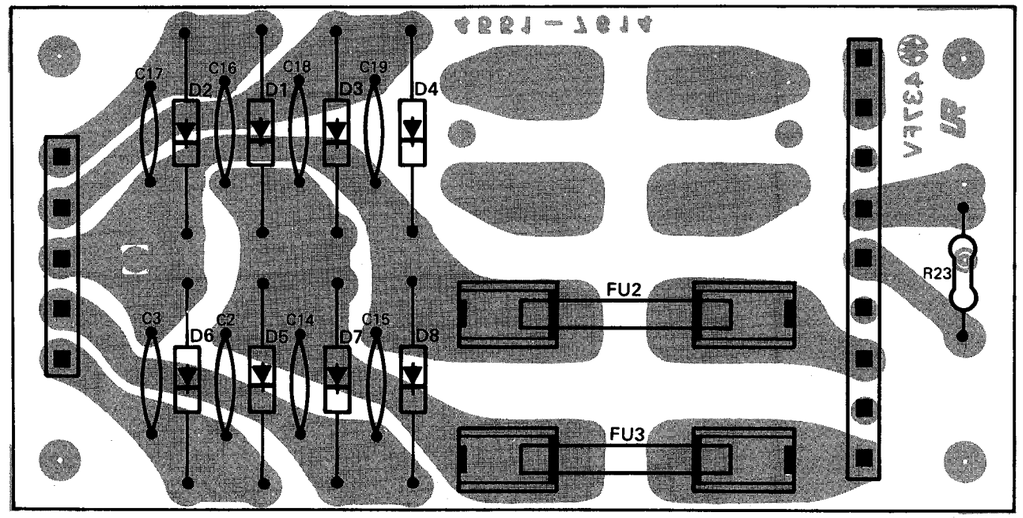
Ref. No.	Part No.	Description
	RESISTORS	
VR201, 301	5101-20371913	Variable Resistor, 20 kΩ
VR302, 354	5101-50271913	Variable Resistor, 5 kΩ
VR303	5101-20171913	Variable Resistor, 200 Ω
VR352, 353, 355	5101-50371913	Variable Resistor, 50 kΩ
	CAPACITORS, ELECTROLYTIC	
C208	5345-105-50	1μF +75%—10% 50V
C209, 273, 302, 354	5345-106-16	10μF +50%—10% 16V
C260, 353, 360	5345-475-25	4.7μF +50%—10% 25V
C265	5345-226-16	22μF +50%—10% 16V
C271, 274, 351	5345-104F0212	0.1μF ±20% 50V
C301	5345-475D0212	4.7μF ±20% 25V
C303, 304, 306, 352	5345-105F0212	1μF ±20% 50V
C305	5345-685D0212	6.8μF ±20% 25V
C319, 320	5345-225F0212	2.2μF ±20% 50V
C323	5345-107-16	100μF+50%—10% 16V
VC101, 102, 103, 251, 252	5315-718	5-Gang Variable Capcitor (w/Trimmers TC101, 102, 251, 252)
TC103	5371-55	Trimmer Capacitor
	INTEGRATED CIRCUITS	
IC201	5652-HA11225	HA11225 FM IF Amp. & FM Det.
IC301	5652-KB4437	KB3337 FM Multiplex
	TRANSISTORS	
Q101	5616-3SK45(B)	F.E.T., 3SK45(B) FM RF Amp.
Q102	5613-535(B)	2SC535(B) FM Mixer
Q103	5613-2058(N)	2SC2058(N) FM Osc.
Q104	5611-999(F)	2SA999(F) FM AGC Switching
Q201, 202	5613-2058(N)	2SC2058(N) FM IF Amp.
Q203	5611-999(F)	2SA999(F) FM Voltage Supply
Q251	5613-2058(N)	2SC2058(N) AM Osc.
Q252	5613-2058(N)	2SC2058(N) AM Mixer
Q253, 254	5613-2058(N)	2SC2058(N) AM IF Amp.
Q255	5613-2320(F)	2SC2320(F) AM Signal Switching
Q256	5611-999(F)	2SA999(F) AM Voltage Supply
Q301, 302	5611-999(F)	2SA999(F) } MPX Output Amp.
Q303, 304	5613-2320(F)	2SC2320(F) }
Q305, 306	5613-2320(F)	2SC2320(F) FM Muting
Q351	5613-2320(F)	2SC2320(F) Station Lock Indicator Driver
Q352	5613-2320(F)	2SC2320(F) Stereo FM Indicator Control
Q353	5613-2320(F)	2SC2320(F) } FM Muting
Q354	5611-999(F)	2SA999(F) }
Q355	5616-2SK163(M	F.E.T., 2SK163(M) } Signal Strength Display Level Amp.
Q356	5611-999(F)	2SA999(F) }
	DIODES	
D201, 254, 351, 352, 353, 354, 356, 357, 358	5631-1S2473	1S2473
D251, 252, 253	5631-1N34A	1N34A
D303	5635-RD6R2EB1	Zener, RD6.2EB1
	COILS	
L102	5943-70125	FM RF
L103	5943-70225	FM RF
L104	5991-7065	FM IF Trap
L105	5942-70215	FM Osc.
L106	5995-3R3225	RF Choke
L201	5995-101225	RF Choke
L252	5923-70327	AM Osc.
L301	5995-100225	RF Choke
	TRANSFORMERS	
T101	5563-0027	FM IF
T201	5574-7023	Quadrature Det.
T251, 252	5553-0097	AM IF
T253	5553-0087	AM IF
	MISCELLANEOUS	
CF201, 202, 203	5671-7117Z	Ceramic Filter, FM IF
FB101, 102	5597-4	Ferrite Bead, Q102 & Q103

LED DISPLAY P.C. BOARD



Ref. No.	Part No.	Description
IC352	5652-BA6104	Integrated Circuit, BA6104 Signal Strength Display Driver
D301	5635-RD6R2EB1	Zener Diode, RD6.2EB1
D302	5637-GL9PR20	Light Emitting Diode, GL9PR20 Stereo FM Indicator
D361, 362, 363, 364, 365	5637-GL105N5	LED Display Assembly, GL105N5 Signal Strength Display
D366	5637-GL9NG2	Light Emitting Diode, Station Lock Indicator
C357	5345-107-16	Capacitor, 100μF +50%—10% 16V Electrolytic

RECTIFIER P.C. BOARD

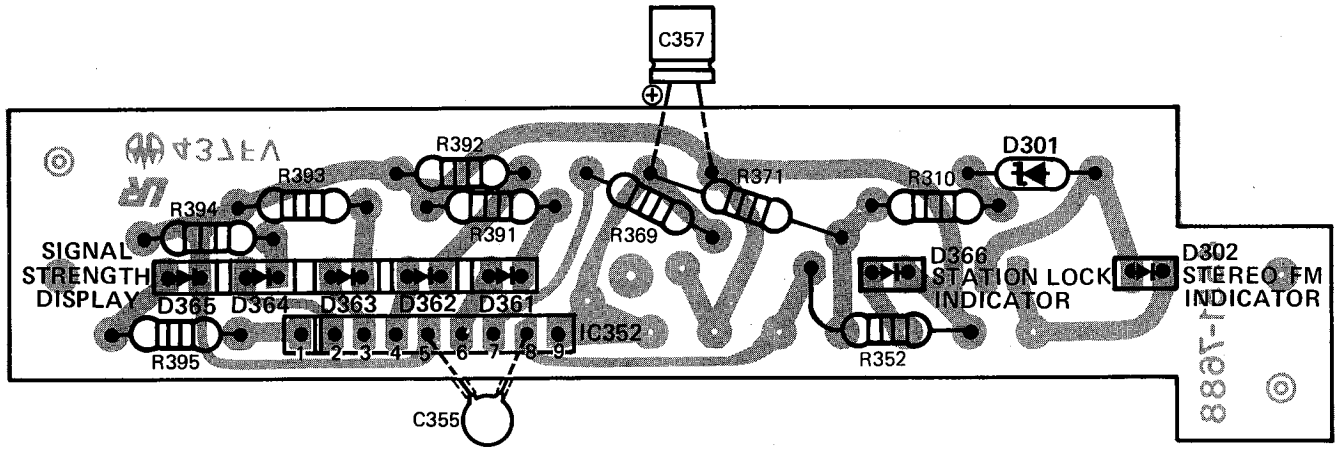


Ref. No.	Part No.	Description
D1, 2, 3, 4, 5, 6, 7, 8	5632-ERC0402L	Diode, ERC0402L
R23	5102-3905114	Resistor, 39Ω ±5% 1/2W Fuse
FU2, 3	5732-402028	Fuse, 4A 125V

TUNER P.C. BOARD

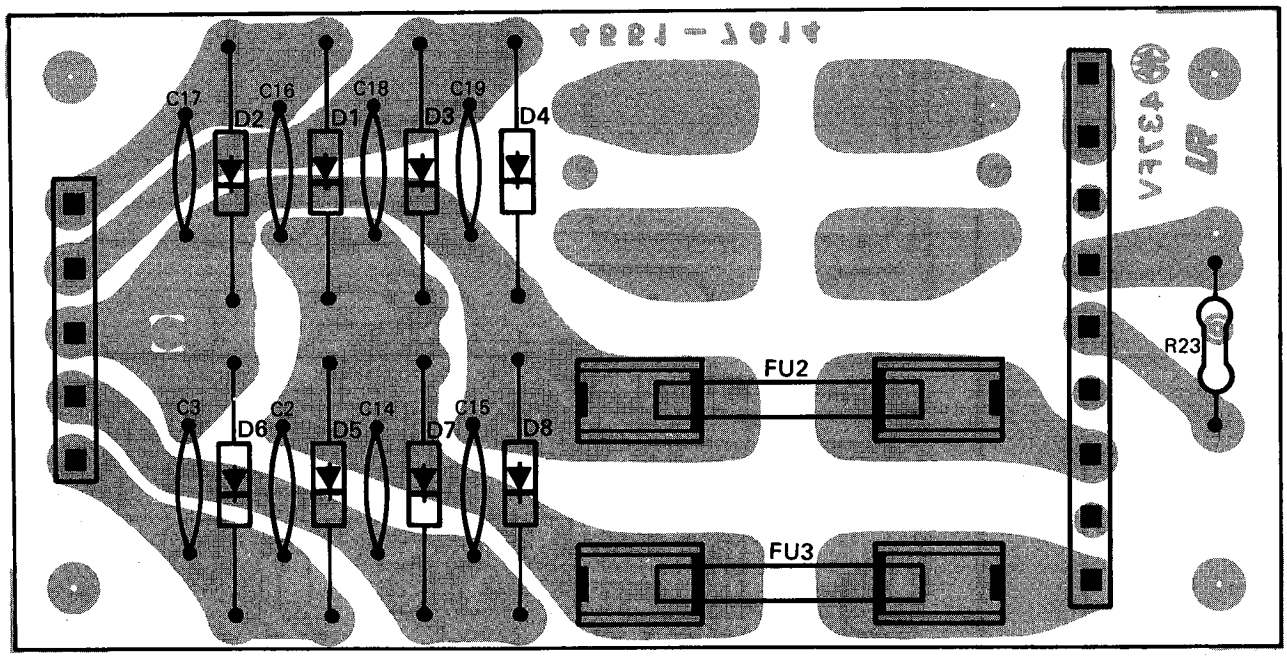
Ref. No.	Part No.	Description
	RESISTORS	
VR201, 301	5101-20371913	Variable Resistor, 20 kΩ
VR302, 354	5101-50271913	Variable Resistor, 5 kΩ
VR303	5101-20171913	Variable Resistor, 200 Ω
VR352, 353, 355	5101-50371913	Variable Resistor, 50 kΩ
	CAPACITORS, ELECTROLYTIC	
C208	5345-105-50	1μF +75%–10% 50V
C209, 273, 302, 354	5345-106-16	10μF +50%–10% 16V
C260, 353, 360	5345-475-25	4.7μF +50%–10% 25V
C265	5345-226-16	22μF +50%–10% 16V
C271, 274, 351	5345-104F0212	0.1μF ±20% 50V
C301	5345-475D0212	4.7μF ±20% 25V
C303, 304, 306, 352	5345-105F0212	1μF ±20% 50V
C305	5345-685D0212	6.8μF ±20% 25V
C319, 320	5345-225F0212	2.2μF ±20% 50V
C323	5345-107-16	100μF+50%–10% 16V
VC101, 102, 103, 251, 252	5315-718	5-Gang Variable Capcitor (w/Trimmers TC101, 102, 251, 252)
TC103	5371-55	Trimmer Capacitor
	INTEGRATED CIRCUITS	
IC201	5652-HA11225	HA11225 FM IF Amp. & FM Det.
IC301	5652-KB4437	KB3337 FM Multiplex
	TRANSISTORS	
Q101	5616-3SK45(B)	F.E.T., 3SK45(B) FM RF Amp.
Q102	5613-535(B)	2SC535(B) FM Mixer
Q103	5613-2058(N)	2SC2058(N) FM Osc.
Q104	5611-999(F)	2SA999(F) FM AGC Switching
Q201, 202	5613-2058(N)	2SC2058(N) FM IF Amp.
Q203	5611-999(F)	2SA999(F) FM Voltage Supply
Q251	5613-2058(N)	2SC2058(N) AM Osc.
Q252	5613-2058(N)	2SC2058(N) AM Mixer
Q253, 254	5613-2058(N)	2SC2058(N) AM IF Amp.
Q255	5613-2320(F)	2SC2320(F) AM Signal Switching
Q256	5611-999(F)	2SA999(F) AM Voltage Supply
Q301, 302	5611-999(F)	2SA999(F) } MPX Output Amp.
Q303, 304	5613-2320(F)	2SC2320(F) } MPX Output Amp.
Q305, 306	5613-2320(F)	2SC2320(F) FM Muting
Q351	5613-2320(F)	2SC2320(F) Station Lock Indicator Driver
Q352	5613-2320(F)	2SC2320(F) Stereo FM Indicator Control
Q353	5613-2320(F)	2SC2320(F) } FM Muting
Q354	5611-999(F)	2SA999(F) } FM Muting
Q355	5616-2SK163(M	F.E.T., 2SK163(M) } Signal Strength Display Level Amp.
Q356	5611-999(F)	2SA999(F) } Signal Strength Display Level Amp.
	DIODES	
D201, 254, 351, 352, 353, 354, 356, 357, 358	5631-1S2473	1S2473
D251, 252, 253	5631-1N34A	1N34A
D303	5635-RD6R2EB1	Zener, RD6.2EB1
	COILS	
L102	5943-70125	FM RF
L103	5943-70225	FM RF
L104	5991-7065	FM IF Trap
L105	5942-70215	FM Osc.
L106	5995-3R3225	RF Choke
L201	5995-101225	RF Choke
L252	5923-70327	AM Osc.
L301	5995-100225	RF Choke
	TRANSFORMERS	
T101	5563-0027	FM IF
T201	5574-7023	Quadrature Det.
T251, 252	5553-0097	AM IF
T253	5553-0087	AM IF
	MISCELLANEOUS	
CF201, 202, 203	5671-7117Z	Ceramic Filter, FM IF
FB101, 102	5597-4	Ferrite Bead, Q102 & Q103

LED DISPLAY P.C. BOARD



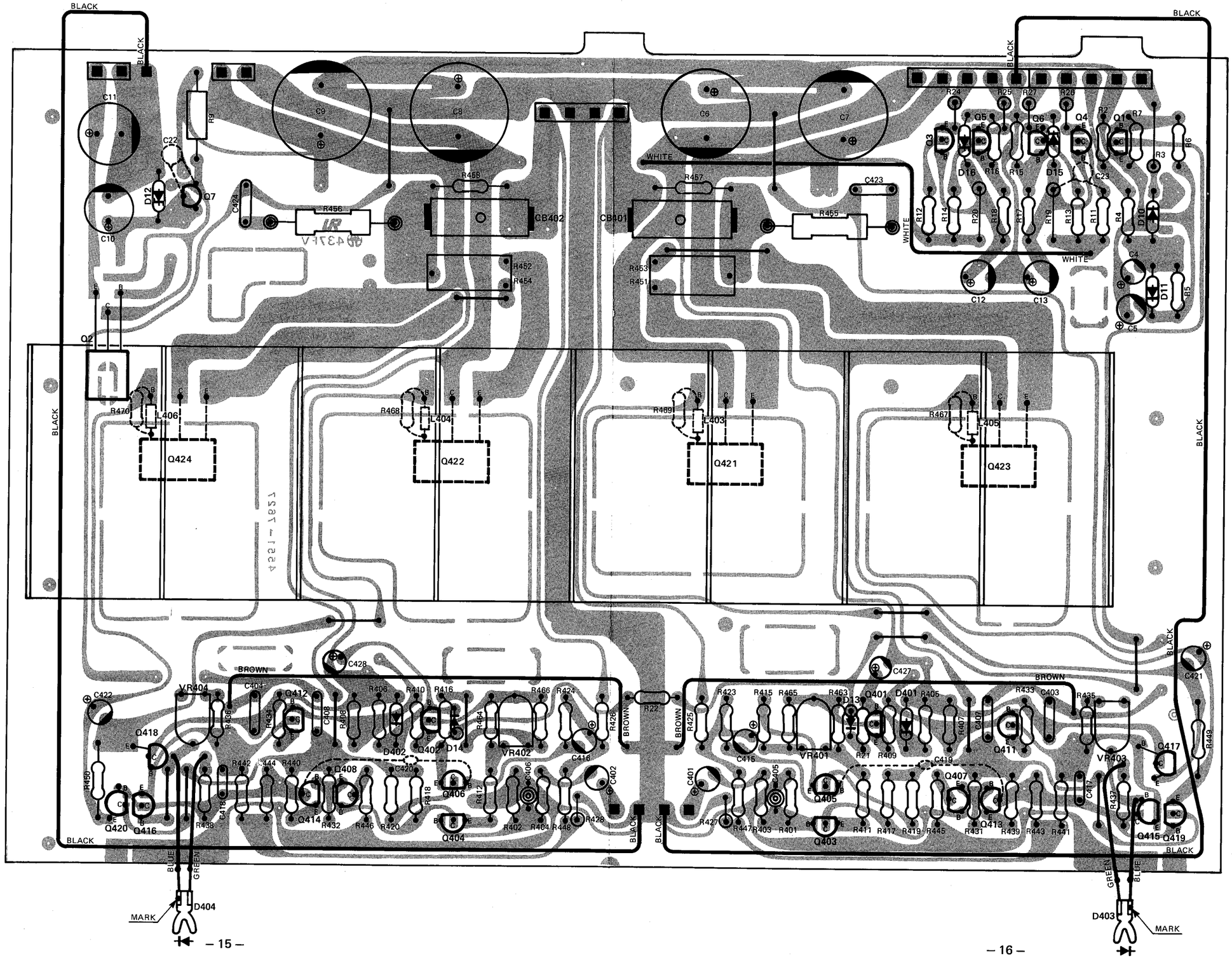
Ref. No.	Part No.	Description
IC352	5652-BA6104	Integrated Circuit, BA6104 Signal Strength Display Driver
D301	5635-RD6R2EB1	Zener Diode, RD6.2EB1
D302	5637-GL9PR20	Light Emitting Diode, GL9PR20 Stereo FM Indicator
D361, 362, 363, 364, 365	5637-GL105N5	LED Display Assembly, GL105N5 Signal Strength Display
D366	5637-GL9NG2	Light Emitting Diode, Station Lock Indicator
C357	5345-107-16	Capacitor, 100μF +50%—10% 16V Electrolytic

RECTIFIER P.C. BOARD

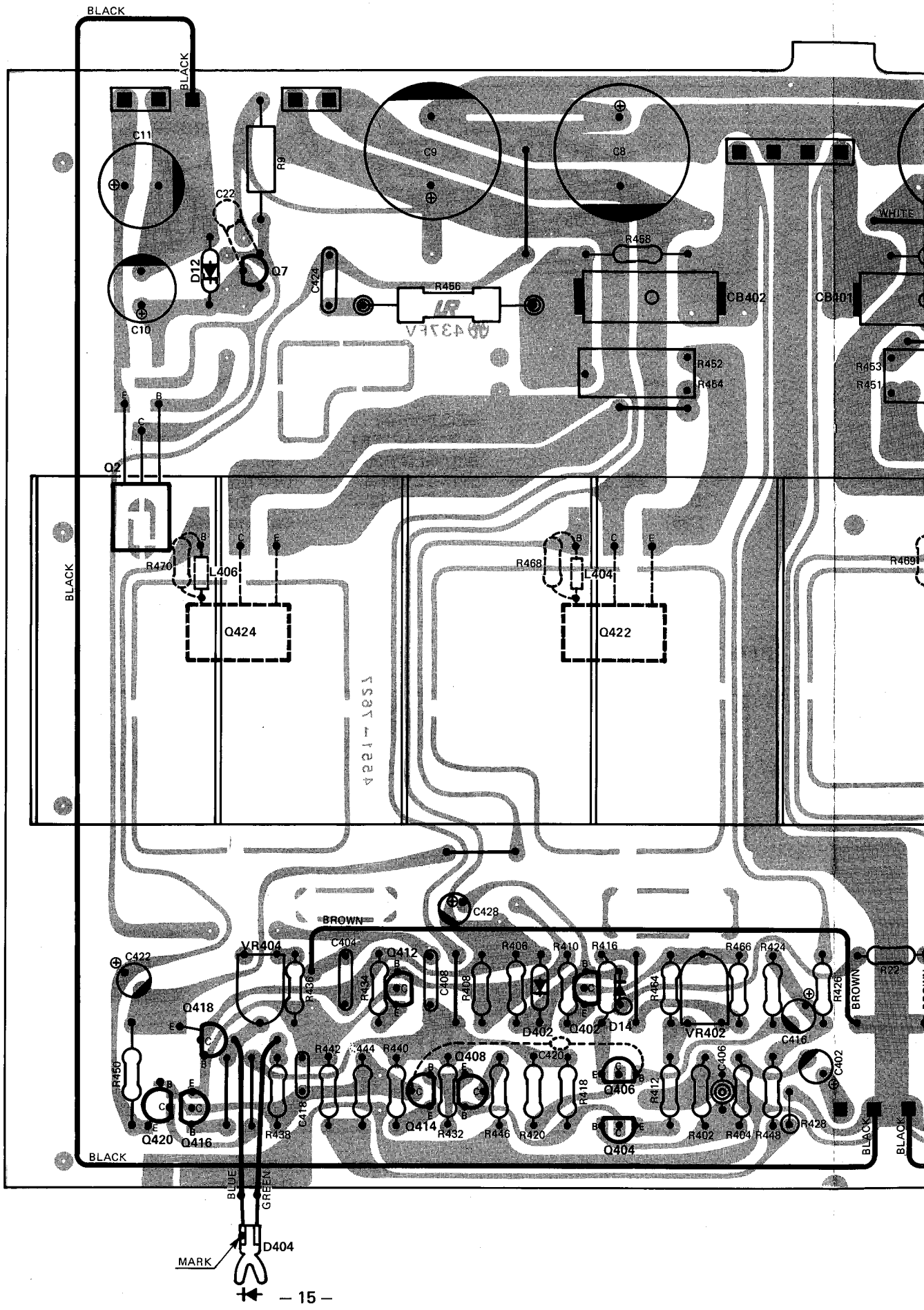


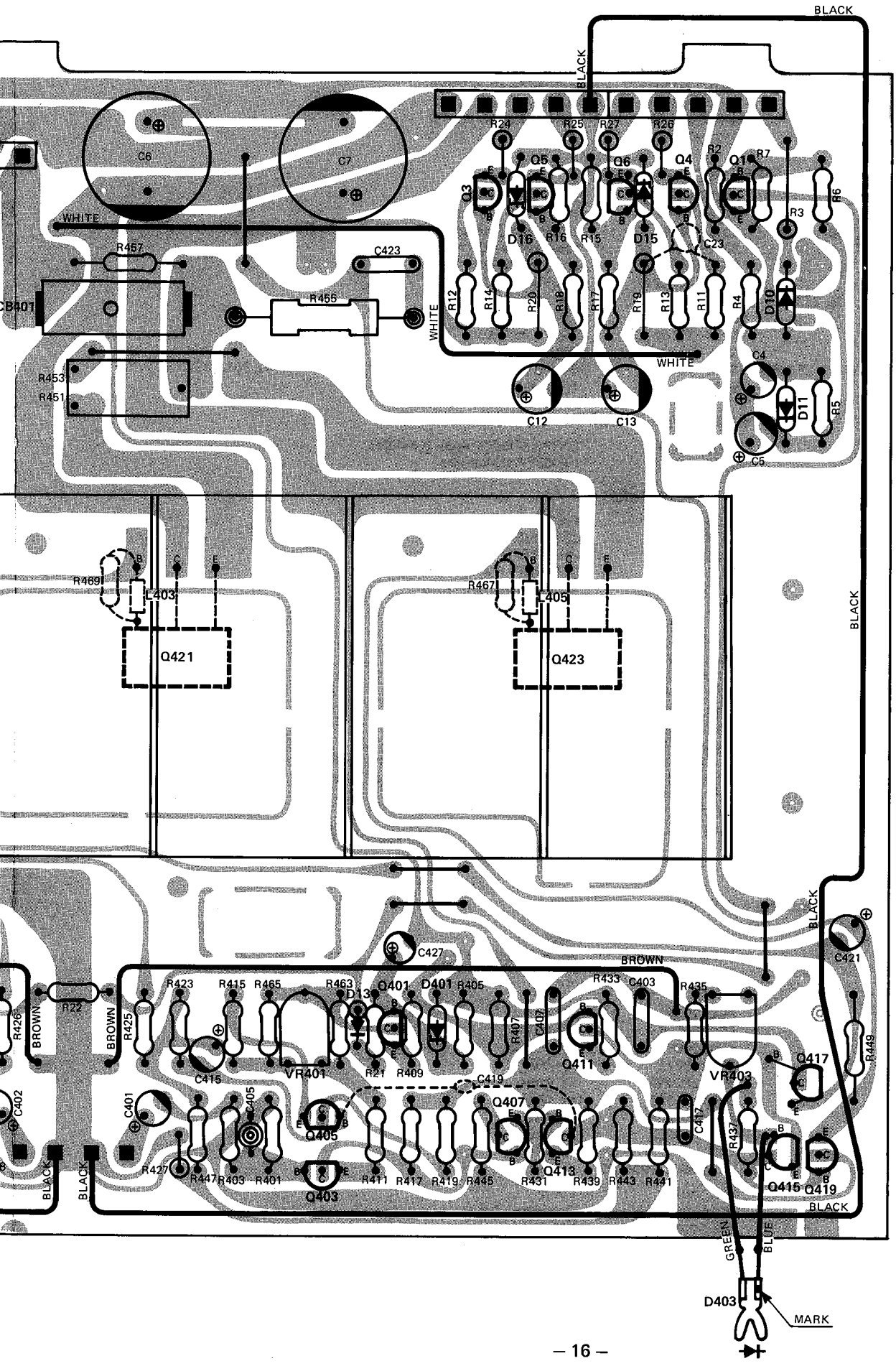
Ref. No.	Part No.	Description
D1, 2, 3, 4, 5, 6, 7, 8	5632-ERC0402L	Diode, ERC0402L
R23	5102-3905114	Resistor, 39Ω ±5% 1/2W Fuse
FU2, 3	5732-402028	Fuse, 4A 125V

POWER AMP. P.C. BOARD



POWER AMP. P.C. BOARD

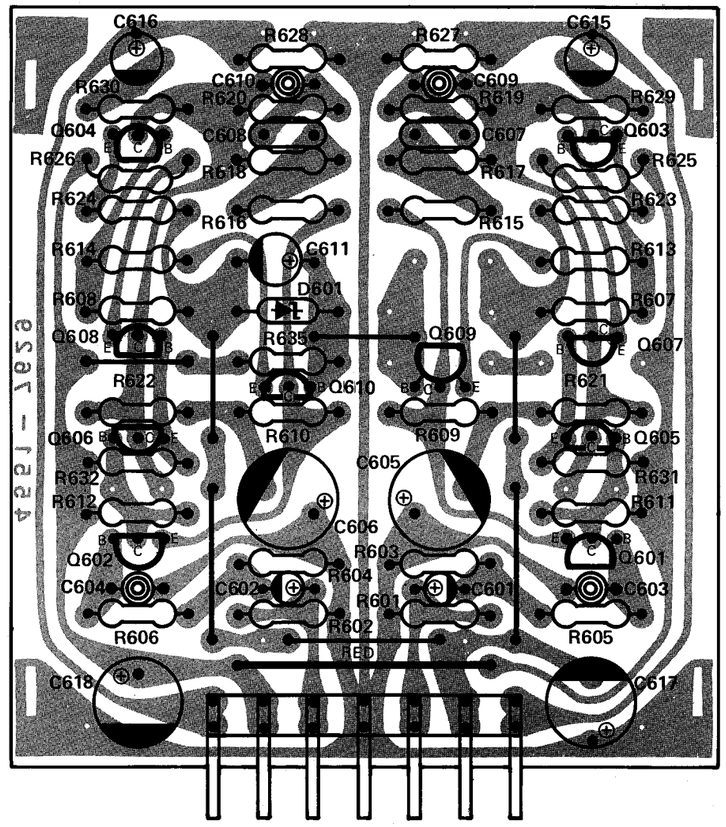



BLACK
BLACK
R24
R25
R27
R26
Q5
Q6
Q4
Q1
R2
R7
Q3
C6
C7
WHITE
R457
C423
R455
CB401
R453
R451
D16
R16
R15
D15
C23
R3
R6
R12
R14
R20
R18
R17
R19
R13
R11
R4
D10
WHITE
C4
C12
C13
D11
R5
C5
R469
L403
Q421
R467
L405
Q423
BLACK
C427
BROWN
C421
R22
R423
R415
R465
R463
Q401
D401
R405
R433
C403
R435
R426
BROWN
BROWN
R425
C415
VR401
D13
R21
R409
R407
C407
Q411
VR403
Q417
R449
C402
C401
C405
C419
Q407
Q405
C417
R437
R427
R447
R403
R401
Q403
R411
R417
R419
R445
Q413
R431
R439
R443
R441
Q415
Q419
BLACK
BLACK
BLACK
GREEN
BLUE
D403
MARK

POWER AMP. P.C. BOARD

Ref. No.	Part No.	Description
	RESISTORS	
R9	5102-3905711	39Ω ±5% 1W Fuse
R11, 433, 434, 439, 440	5102-1014713	100Ω ±2% 1/4W Fuse
R12	5102-3314713	330Ω ±2% 1/4W Fuse
R13, 14	5102-3914713	390Ω ±2% 1/4W Fuse
VR401, 402	5101-1017913	Variable Resistor, 100Ω
VR403, 404	5101-5017913	Variable Resistor, 500Ω
	CAPACITORS, ELECTROLYTIC	
C4	5345-336-16	33μF +50%–10% 16V
C5	5345-107-06	100μF +50%–10% 6.3V
C6, 7, 8, 9	5341-478F0955	4700μF ±20% 50V
C10	5345-337-16	330μF +50%–10% 16V
C11	5345-100-16	1000μF +50%–10% 16V
C12, 13	5345-476-25	47μF +50%–10% 25V
C401, 402	5345-107E0951	100μF ±20% 10V
C415, 416	5345-105-50	1μF +75%–10% 50V
C421, 422	5345-106-50	10μF +50%–10% 50V
C427, 428	5345-104F0951	0.1μF ±20% 50V
	TRANSISTORS	
Q1	5611-999(F)	2SA999(F) Audio Muting
Q2	5613-1419(C)	2SC1419(C) Voltage Regulator
Q3	5613-2320(F)	2SC2320(F) Voltage Regulator
Q4, 6	5611-965(O)	2SA965(O) Voltage Regulator
Q5	5613-2235(O)	2SC2235(O) Voltage Regulator
Q7	5616-2SK163(M	F.E.T., 2SK163(M) Current Regulator
Q401, 402	5613-2320(F)	2SC2320(F)
Q403, 404, 405, 406	5613-1775(F)	2SC1775(F)
Q407, 408	5611-999(F)	2SA999(F)
Q411, 412	5613-2229(Y)	2SC2229(Y)
Q413, 414	5611-949(Y)	2SA949(Y)
Q415, 416	5613-945(K)	2SC945(K) } Power Amp.
Q417, 418	5611-965(O)	2SA965(O)
Q419, 420	5613-2235(O)	2SC2235(O)
Q421, 422	5612-686(O)	2SB686(O)
Q423, 424	5614-716(O)	2SD716(O)
	DIODES	
D10, 11, 13, 14	5636-1S2472	1S2472
D12	5635-RD15EB2	Zener, RD15EB2
D15, 16	5635-RD20EB3	Zener, RD20EB3
D401, 402	5635-RD13EB	Zener, RD13EB
D403, 404	5641-MV12YM	Varistor, MV12YM
	MISCELLANEOUS	
CB401, 402	4361-202014	Speaker Protector
L403, 404, 405, 406	5597-35502	Ferrite Bead

PHONO EQUALIZER P.C. BOARD

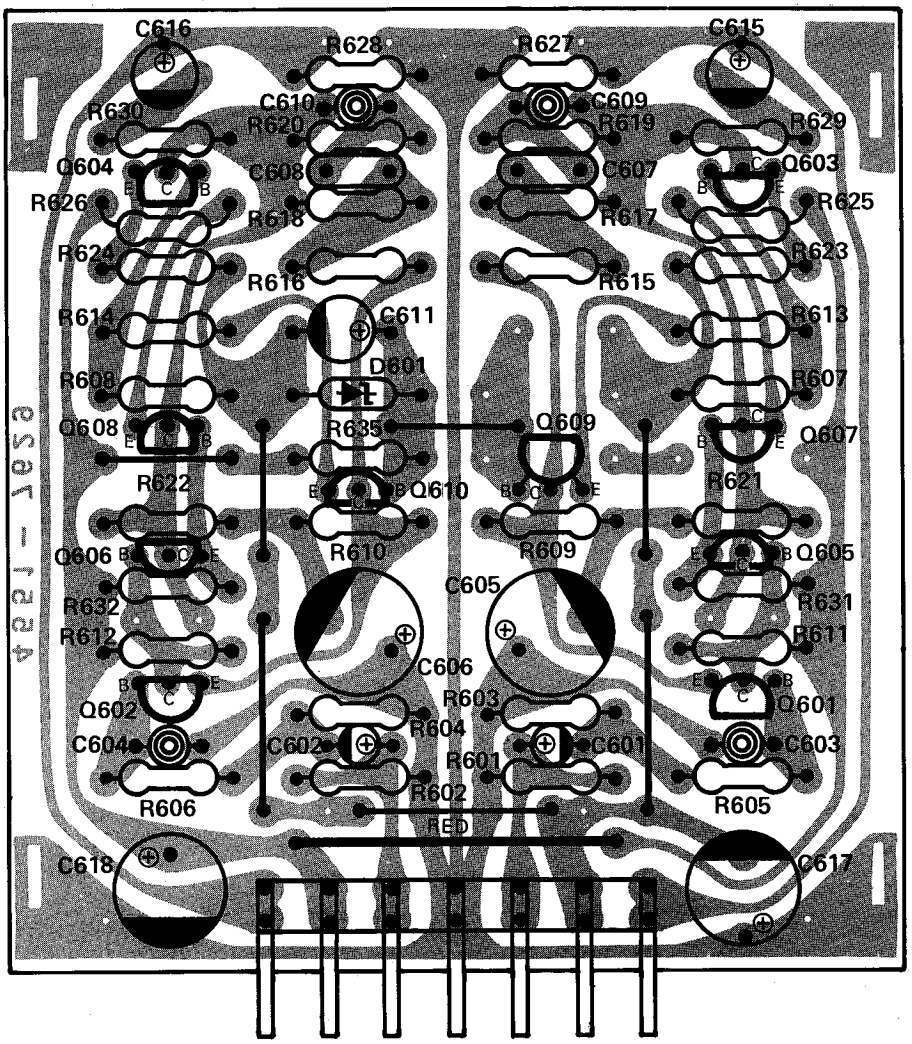


Ref. No.	Part No.	Description
	CAPACITORS, ELECTROLYTIC	
C601, 602	5345-336B0951	33μF ±20% 10V
C605, 606	5345-337-06	330μF +50%–10% 6.3V
C611	5345-106-16	10μF +50%–10% 16V
C615, 616	5345-106C0951	10μF ±20% 16V
C617, 618	5345-107-25	100μF +50%–10% 25V
	TRANSISTORS	
Q601, 602	5613-2320L(F)	2SC2320L(F)
Q603, 604, 609, 610	5613-2320(F)	2SC2320(F) } Equalizer Amp.
Q605, 606, 607, 608	5611-999(F)	2SA999(F)
	DIODE	
D601	5635-RD5R1EB2	Zener, RD5.1EB2

POWER AMP. P.C. BOARD

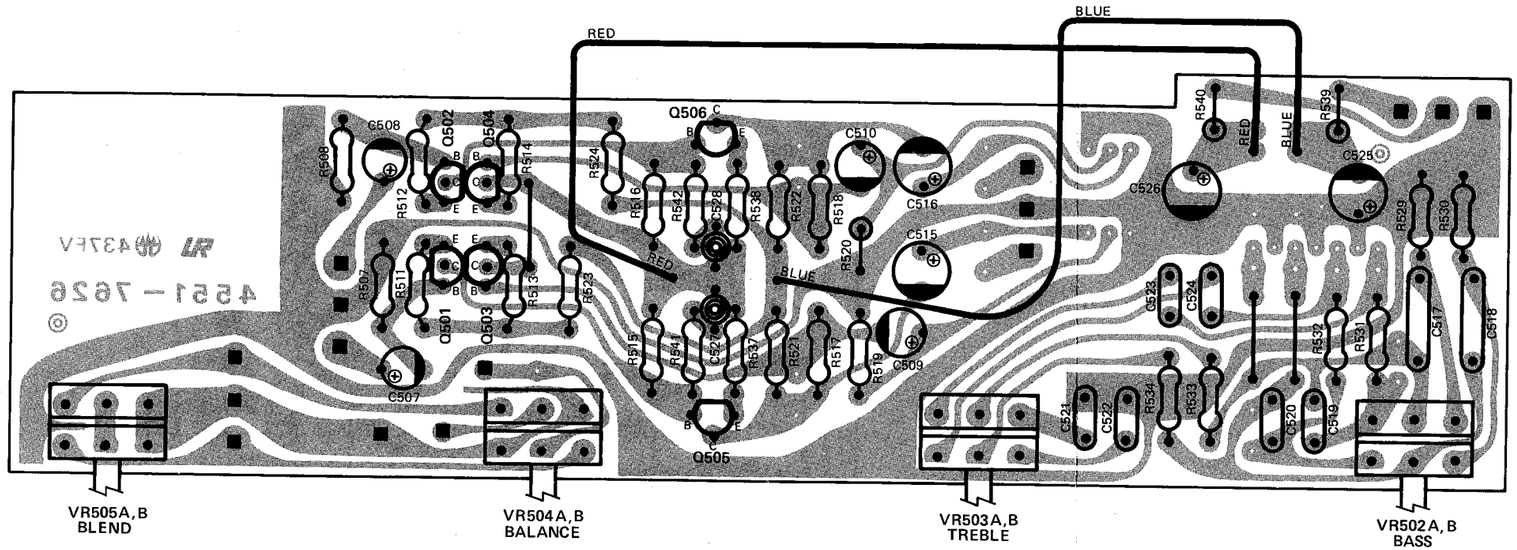
Ref. No.	Part No.	Description
	RESISTORS	
R9	5102-3905711	39Ω ±5% 1W Fuse
R11, 433, 434, 439, 440	5102-1014713	100Ω ±2% 1/4W Fuse
R12	5102-3314713	330Ω ±2% 1/4W Fuse
R13, 14	5102-3914713	390Ω ±2% 1/4W Fuse
VR401, 402	5101-1017913	Variable Resistor, 100Ω
VR403, 404	5101-5017913	Variable Resistor, 500Ω
	CAPACITORS, ELECTROLYTIC	
C4	5345-336-16	33μF +50%–10% 16V
C5	5345-107-06	100μF +50%–10% 6.3V
C6, 7, 8, 9	5341-478F0955	4700μF ±20% 50V
C10	5345-337-16	330μF +50%–10% 16V
C11	5345-100-16	1000μF +50%–10% 16V
C12, 13	5345-476-25	47μF +50%–10% 25V
C401, 402	5345-107E0951	100μF ±20% 10V
C415, 416	5345-105-50	1μF +75%–10% 50V
C421, 422	5345-106-50	10μF +50%–10% 50V
C427, 428	5345-104F0951	0.1μF ±20% 50V
	TRANSISTORS	
Q1	5611-999(F)	2SA999(F) Audio Muting
Q2	5613-1419(C)	2SC1419(C) Voltage Regulator
Q3	5613-2320(F)	2SC2320(F) Voltage Regulator
Q4, 6	5611-965(O)	2SA965(O) Voltage Regulator
Q5	5613-2235(O)	2SC2235(O) Voltage Regulator
Q7	5616-2SK163(M	F.E.T., 2SK163(M) Current Regulator
Q401, 402	5613-2320(F)	2SC2320(F)
Q403, 404, 405, 406	5613-1775(F)	2SC1775(F)
Q407, 408	5611-999(F)	2SA999(F)
Q411, 412	5613-2229(Y)	2SC2229(Y)
Q413, 414	5611-949(Y)	2SA949(Y) } Power Amp.
Q415, 416	5613-945(K)	2SC945(K)
Q417, 418	5611-965(O)	2SA965(O)
Q419, 420	5613-2235(O)	2SC2235(O)
Q421, 422	5612-686(O)	2SB686(O)
Q423, 424	5614-716(O)	2SD716(O)
	DIODES	
D10, 11, 13, 14	5636-1S2472	1S2472
D12	5635-RD15EB2	Zener, RD15EB2
D15, 16	5635-RD20EB3	Zener, RD20EB3
D401, 402	5635-RD13EB	Zener, RD13EB
D403, 404	5641-MV12YM	Varistor, MV12YM
	MISCELLANEOUS	
CB401, 402	4361-202014	Speaker Protector
L403, 404, 405, 406	5597-35502	Ferrite Bead

PHONO EQUALIZER P.C. BOARD



Ref. No.	Part No.	Description
	CAPACITORS, ELECTROLYTIC	
C601, 602	5345-336B0951	33μF ±20% 10V
C605, 606	5345-337-06	330μF +50%–10% 6.3V
C611	5345-106-16	10μF +50%–10% 16V
C615, 616	5345-106C0951	10μF ±20% 16V
C617, 618	5345-107-25	100μF +50%–10% 25V
	TRANSISTORS	
Q601, 602	5613-2320L(F)	2SC2320L(F) } Equalizer Amp.
Q603, 604, 609, 610	5613-2320(F)	2SC2320(F) } Equalizer Amp.
Q605, 606, 607, 608	5611-999(F)	2SA999(F) } Equalizer Amp.
	DIODE	
D601	5635-RD5R1EB2	Zener, RD5.1EB2

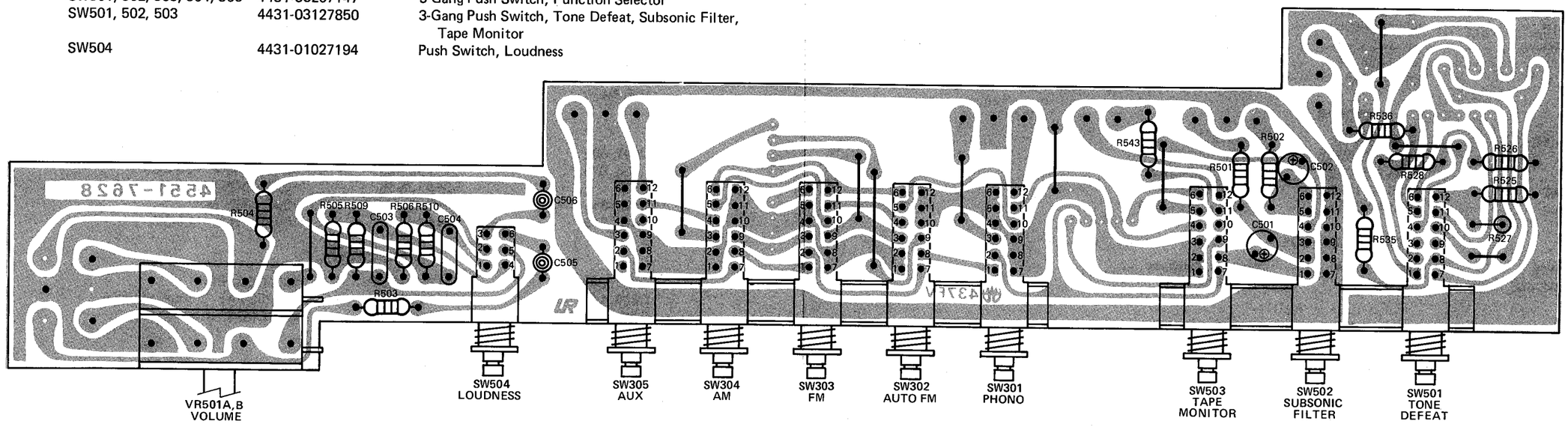
TONE CONTROL P.C. BOARD



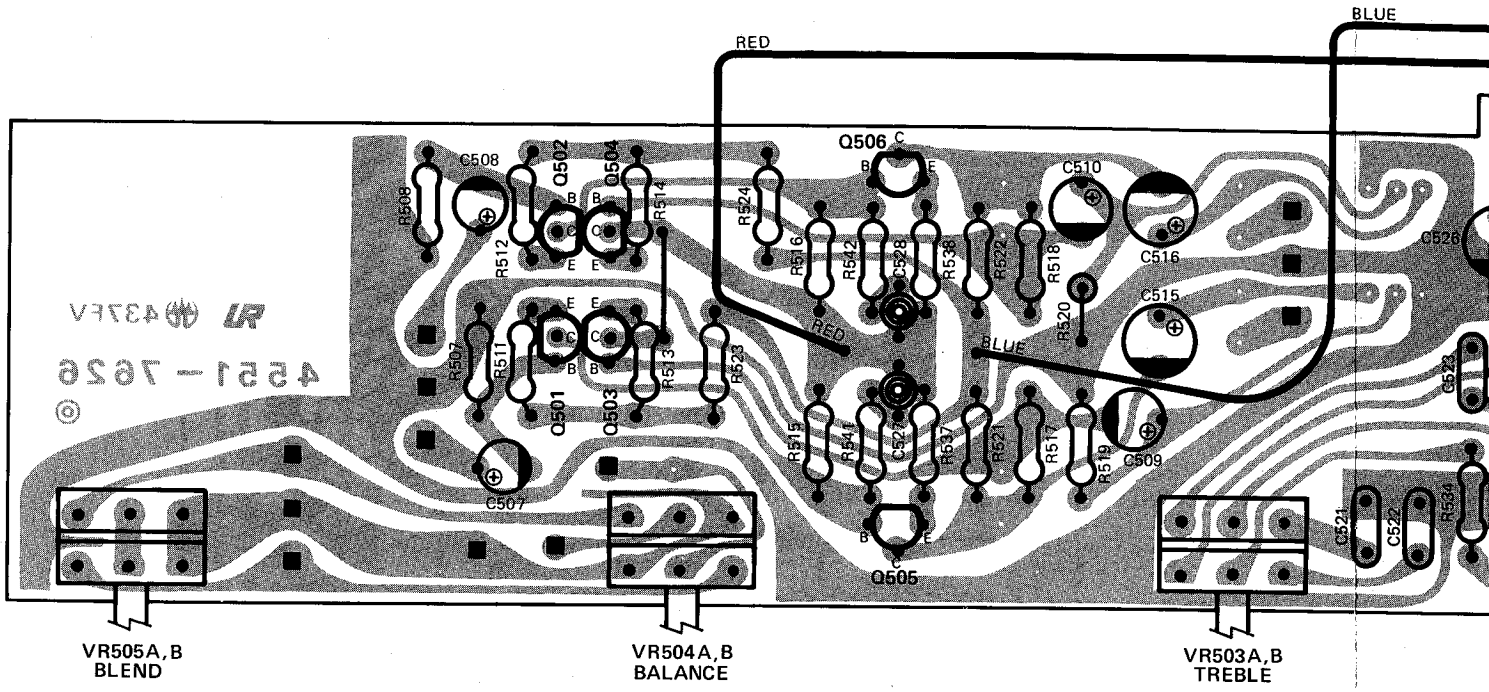
Ref. No.	Part No.	Description
		RESISTORS
VR502A, B	5113-1047877	Variable Resistor, 100kΩ Bass Control
VR503A, B	5113-5037977	Variable Resistor, 50kΩ Treble Control
VR504A, B	5113-50376100	Variable Resistor, 50kΩ Balance Control
VR505A, B	5113-2047140	Variable Resistor, 200kΩ Blend Control
		CAPACITORS, ELECTROLYTIC
C507, 508, 509, 510	5345-106C0951	10μF ±20% 16V
C515, 516	5345-476-10	47μF +50%–10% 10V
C525, 526	5345-107-16	100μF +50%–10% 16V
		TRANSISTORS
Q501, 502, 503, 504	5613-2320(F)	2SC2320(F) } Flat Amp./Tone Control Amp.
Q505, 506	5611-999(F)	2SA999(F) }

VOLUME CONTROL & FUNCTION P.C. BOARD

Ref. No.	Part No.	Description
VR501A, B	5116-1047343	Variable Resistor, 100kΩ Volume Control
C501, 502	5345-474F0951	Capacitor, 0.47μF ±20% 50V Electrolytic
SW301, 302, 303, 304, 305	4431-05207147	5-Gang Push Switch, Function Selector
SW501, 502, 503	4431-03127850	3-Gang Push Switch, Tone Defeat, Subsonic Filter, Tape Monitor
SW504	4431-01027194	Push Switch, Loudness

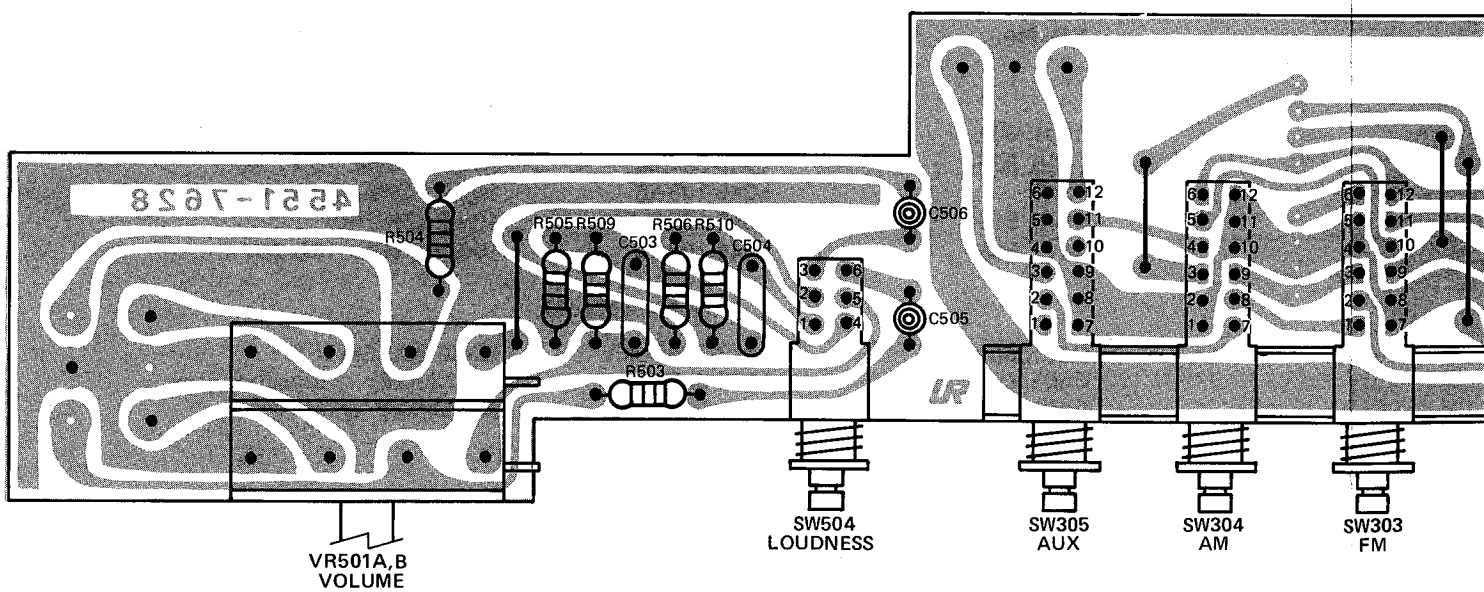


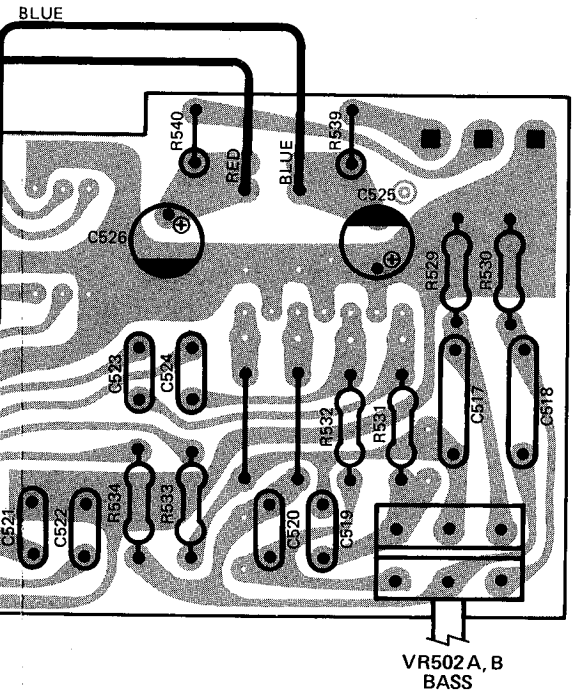
TONE CONTROL P.C. BOARD



VOLUME CONTROL & FUNCTION P.C. BOARD

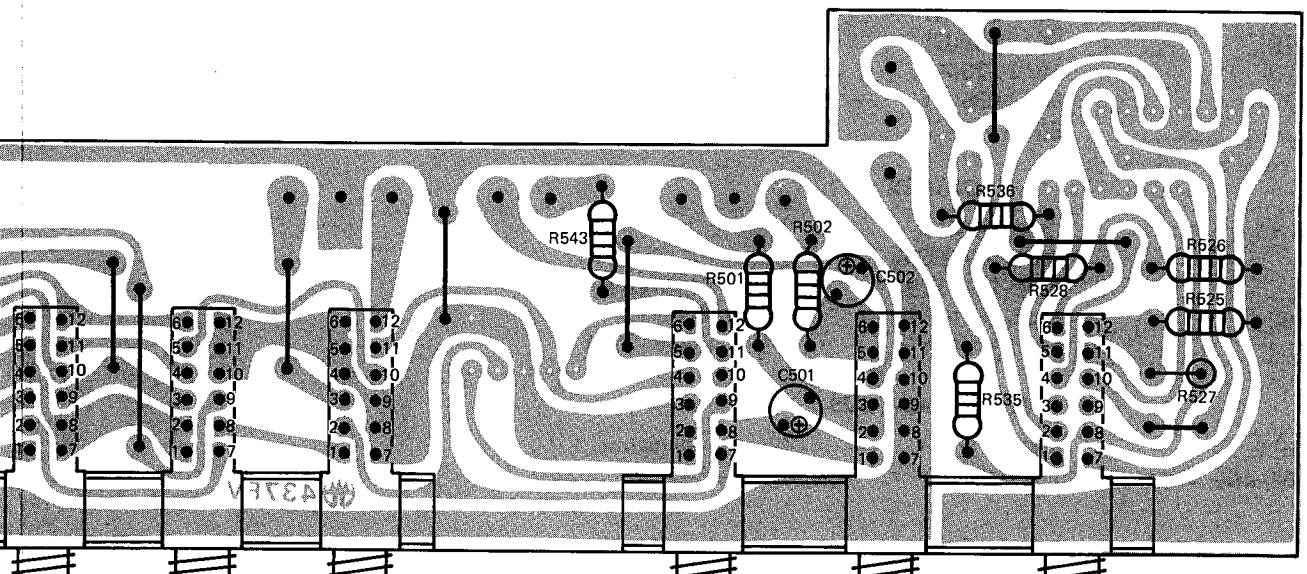
Ref. No.	Part No.	Description
VR501A, B	5116-1047343	Variable Resistor, 100kΩ Volume Control
C501, 502	5345-474F0951	Capacitor, 0.47μF ±20% 50V Electrolytic
SW301, 302, 303, 304, 305	4431-05207147	5-Gang Push Switch, Function Selector
SW501, 502, 503	4431-03127850	3-Gang Push Switch, Tone Defeat, Subsonic Filter, Tape Monitor
SW504	4431-01027194	Push Switch, Loudness



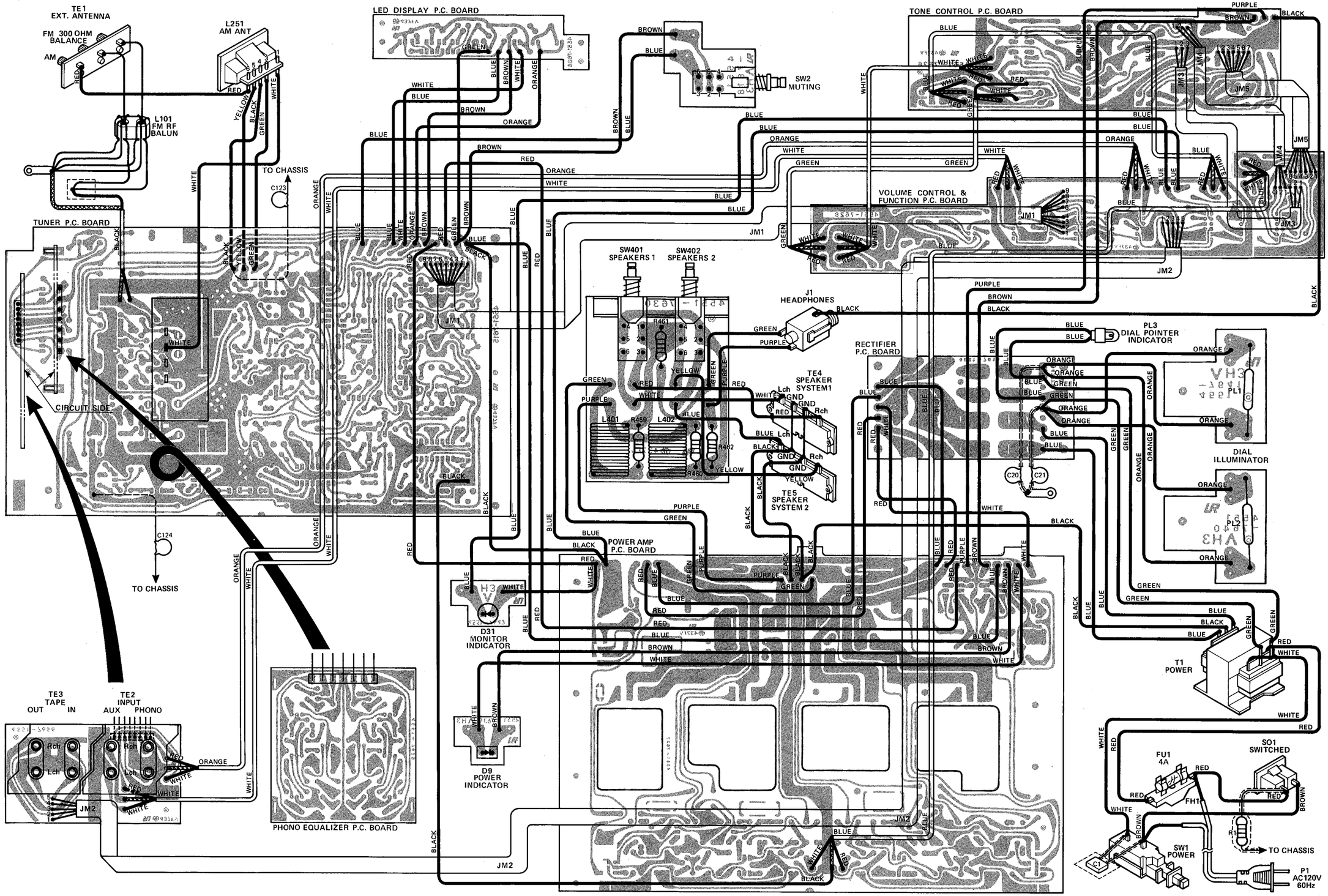


VR502A, B
BASS

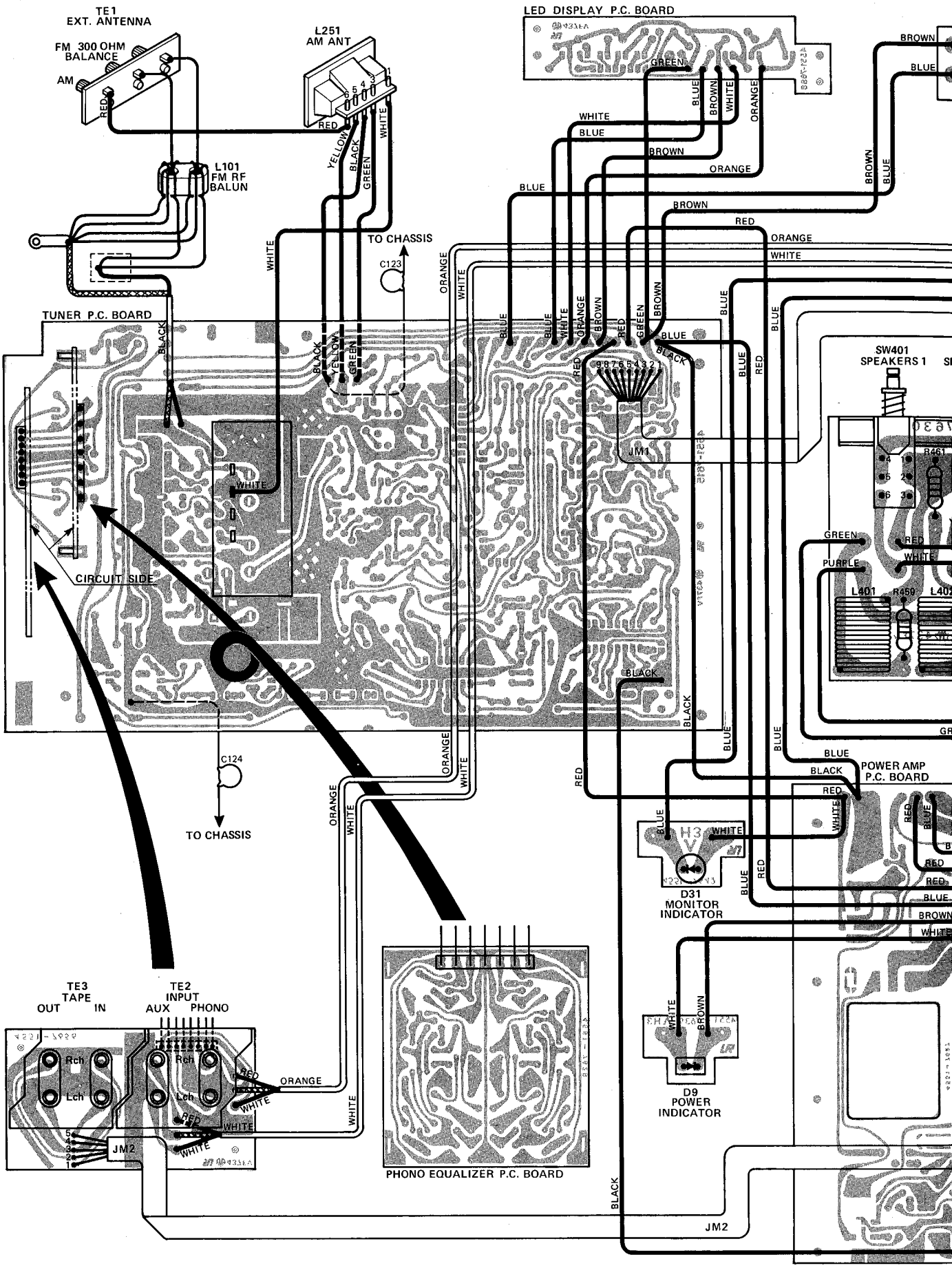
Ref. No.	Part No.	Description
	RESISTORS	
VR502A, B	5113-1047877	Variable Resistor, 100kΩ Bass Control
VR503A, B	5113-5037977	Variable Resistor, 50kΩ Treble Control
VR504A, B	5113-50376100	Variable Resistor, 50kΩ Balance Control
VR505A, B	5113-2047140	Variable Resistor, 200kΩ Blend Control
	CAPACITORS, ELECTROLYTIC	
C507, 508, 509, 510	5345-106C0951	10μF ±20% 16V
C515, 516	5345-476-10	47μF +50%–10% 10V
C525, 526	5345-107-16	100μF +50%–10% 16V
	TRANSISTORS	
Q501, 502, 503, 504	5613-2320(F)	2SC2320(F) } Flat Amp./Tone Control Amp.
Q505, 506	5611-999(F)	2SA999(F) }

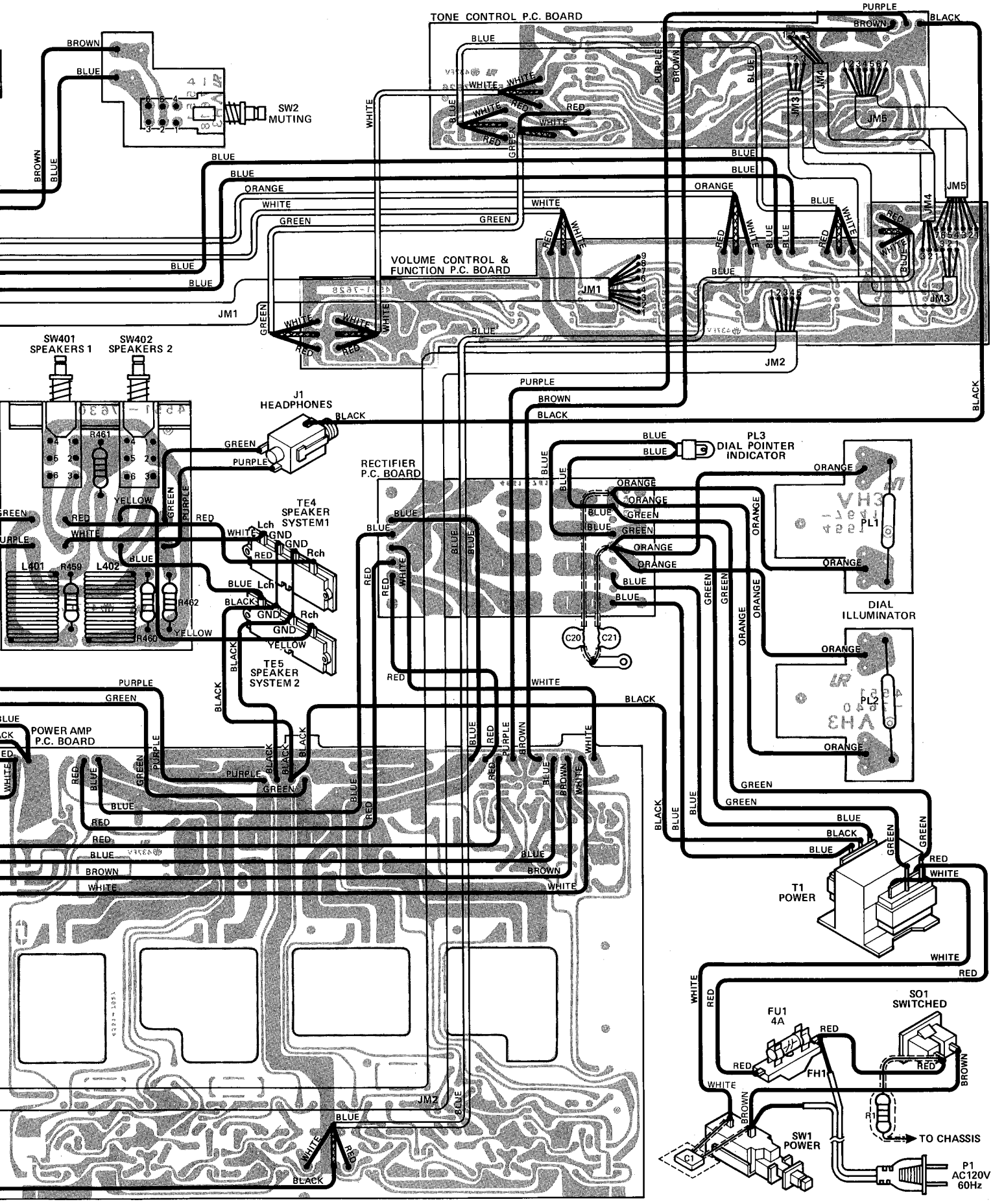


WIRING DIAGRAM

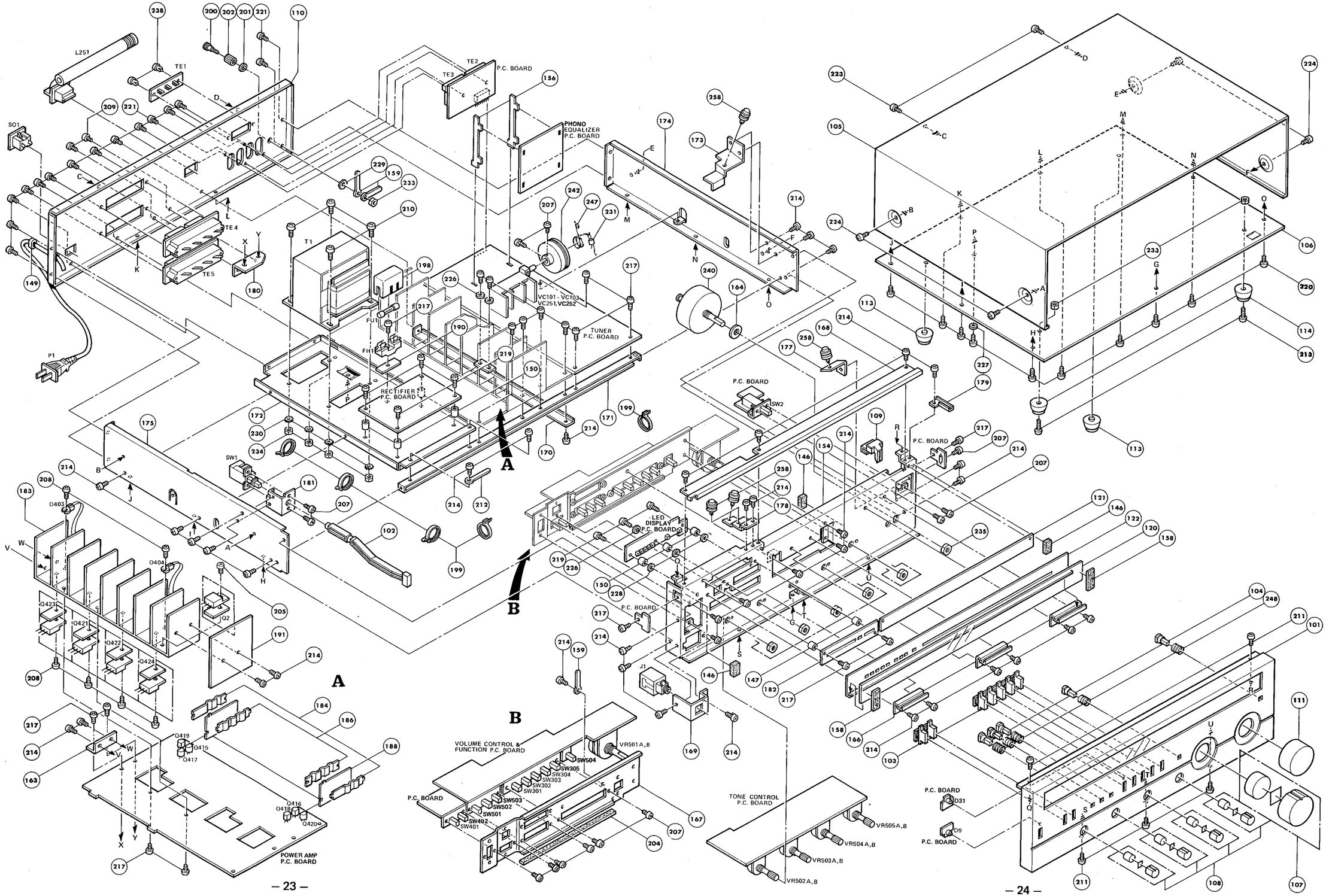


WIRING DIAGRAM

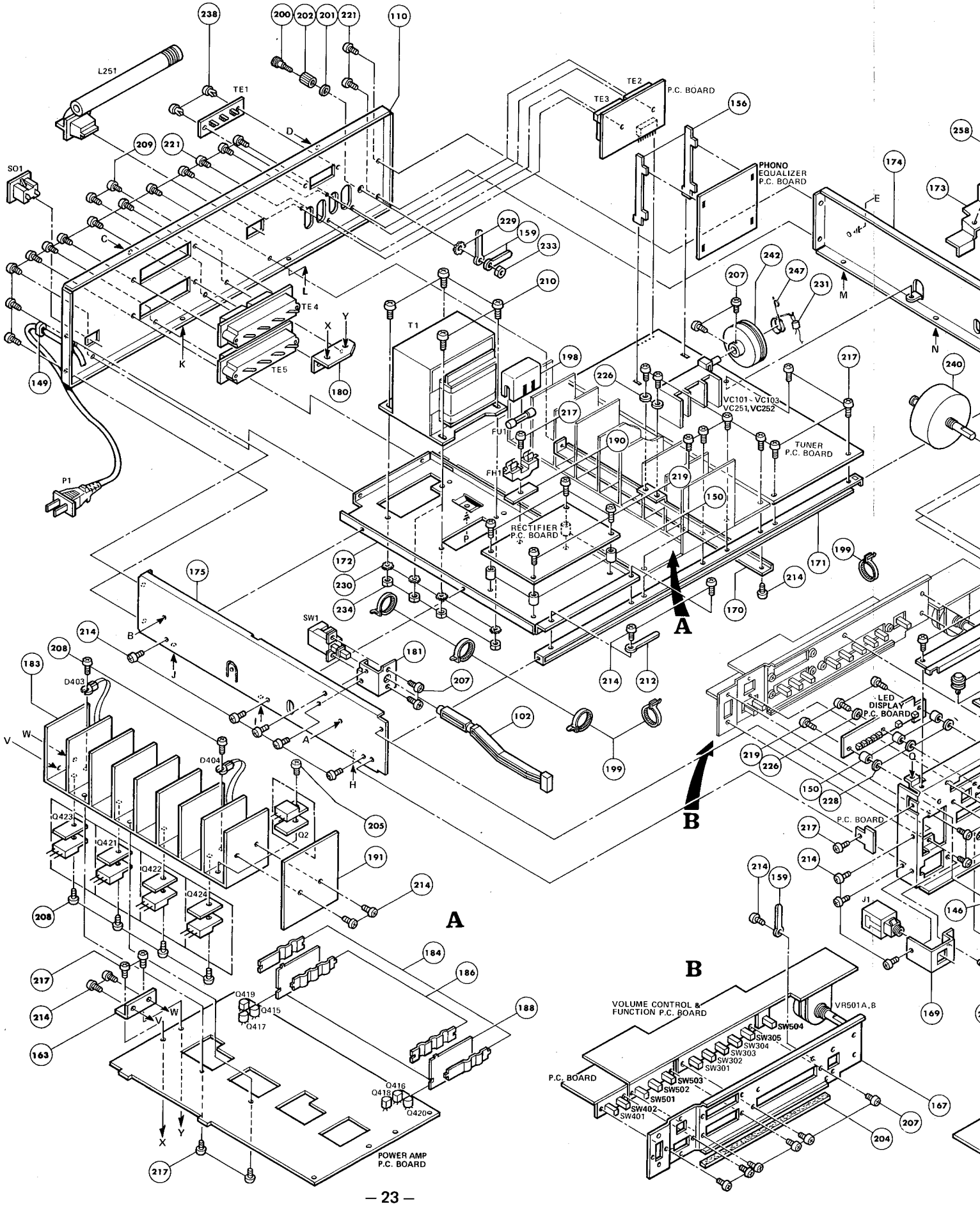


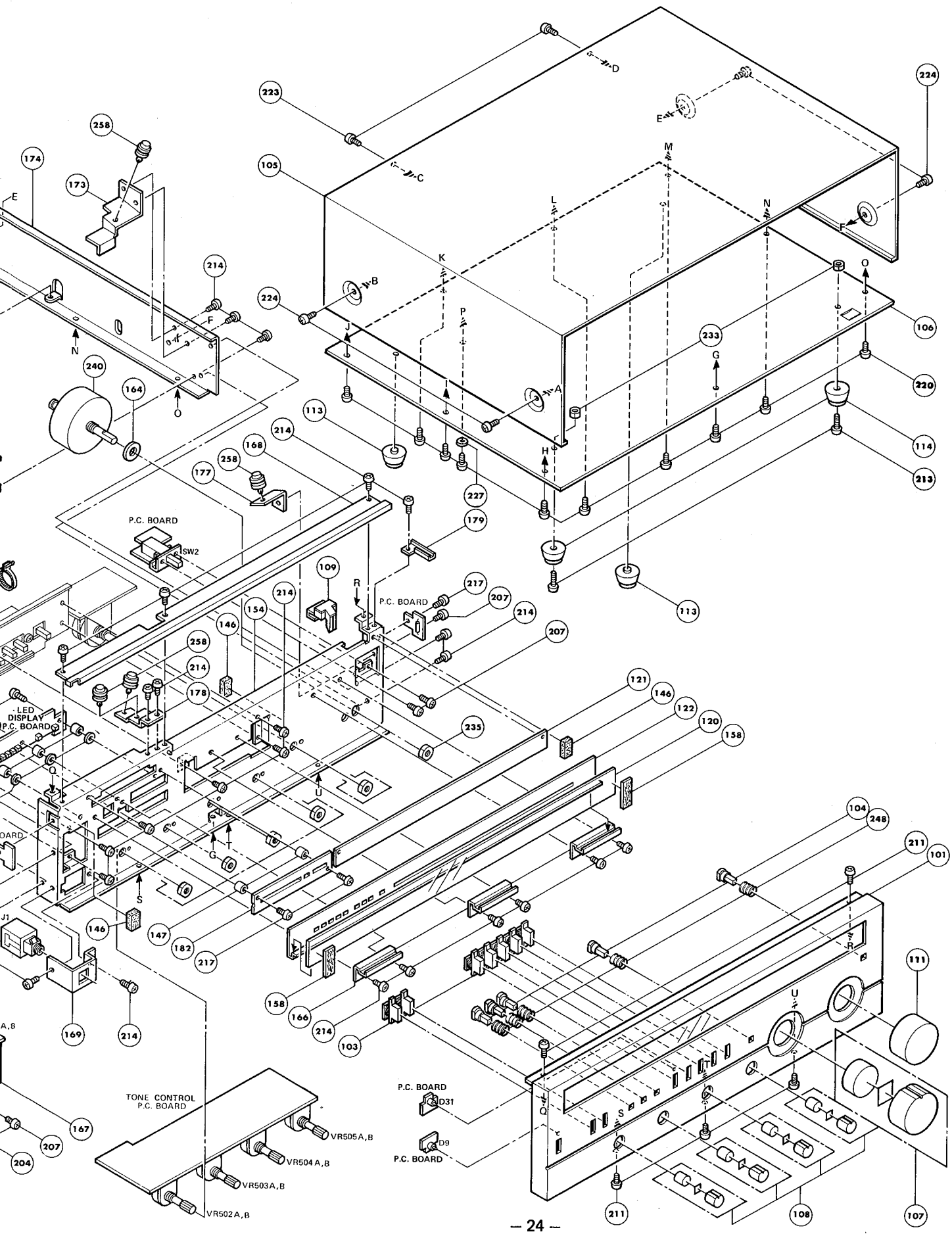

TONE CONTROL P.C. BOARD
SW2
MUTING
VOLUME CONTROL &
FUNCTION P.C. BOARD
JM1
JM2
JM3
JM4
JM5
SW401
SPEAKERS 1
SW402
SPEAKERS 2
J1
HEADPHONES
RECTIFIER
P.C. BOARD
PL3
DIAL POINTER
INDICATOR
PL1
PL2
DIAL
ILLUMINATOR
TE4
SPEAKER
SYSTEM1
TE5
SPEAKER
SYSTEM 2
POWER AMP
P.C. BOARD
T1
POWER
SW1
POWER
FU1
4A
SO1
SWITCHED
TO CHASSIS
P1
AC120V
60Hz
R461
R459
R462
R460
L401
L402
C20
C21
R1
C1
FH1

GENERAL UNIT EXPLODED VIEW



GENERAL UNIT EXPLODED VIEW

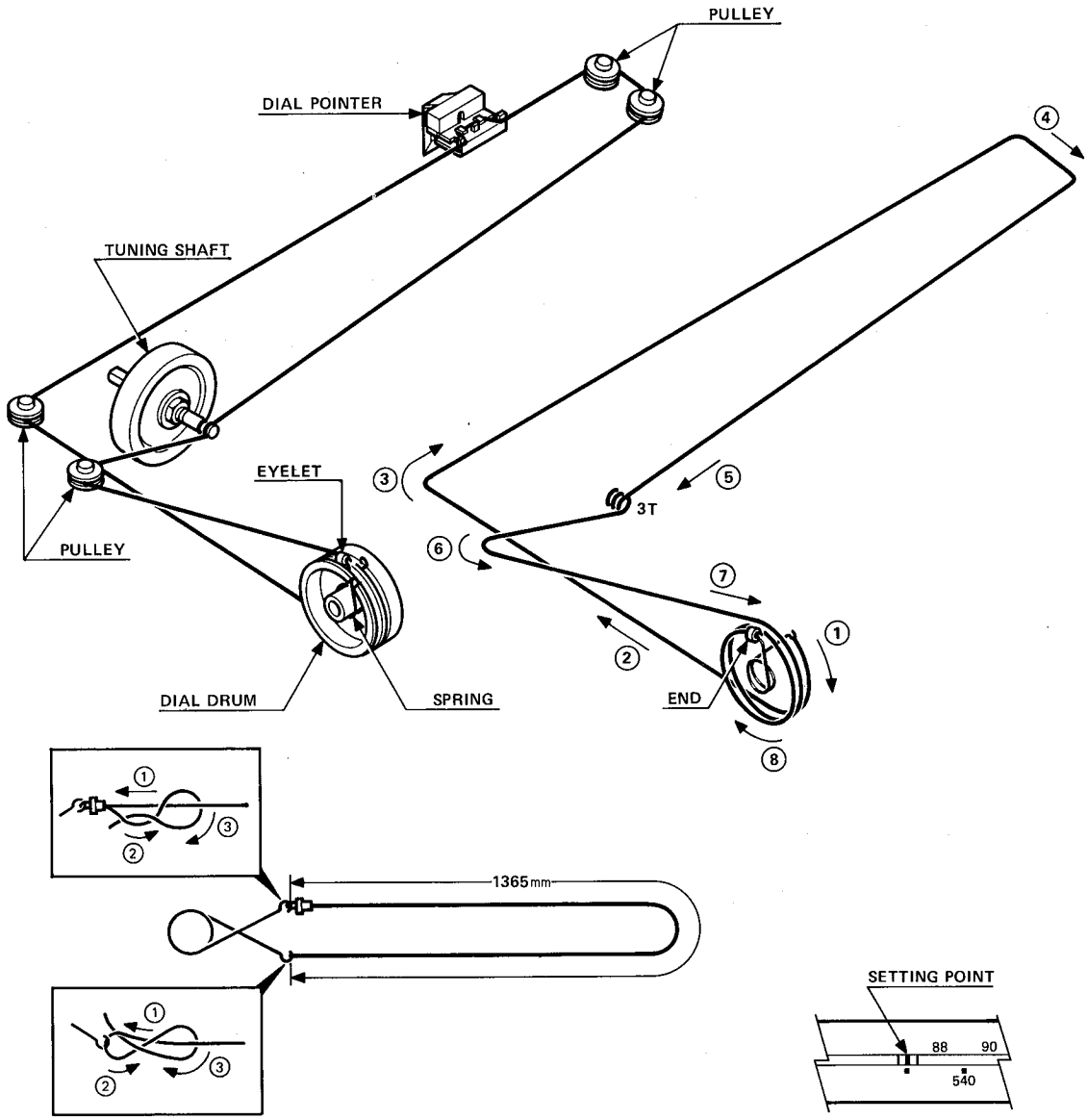



P.C. BOARD
SW2
P.C. BOARD
LED DISPLAY P.C. BOARD
TONE CONTROL P.C. BOARD
VR505A,B
VR504A,B
VR503A,B
VR502A,B
P.C. BOARD
D31
P.C. BOARD
D9

CHASSIS PARTS LIST

Ref. No.	Part No.	Description
	GENERAL UNIT	
101	A443-HK460	Front Panel Assembly
102	A662-HK460-A	Push Button Assembly, Power
103	A662-HK460-B	Push Button Assembly, Speakers, Function
104	A662-HK460-C	Push Button Assembly, Tone Defeat, Subsonic Filter, Tape Monitor, Loudness, Muting
105	A414-HK460	Cabinet Top Assembly
107	A335-HK460-A	Knob Assembly, Volume
108	A634-HK460-A	Knob Assembly, Bass, Treble, Balance, Blend
109	A672-HK460	Dial Pointer Assembly
110	A424-HK460	Cabinet Back Assembly
111	A630-HK460	Knob Assembly, Tuning
113	1319-0139	Foot, Cabinet Bottom Rear
114	1319-7138	Foot, Cabinet Bottom Front
120	1541-01002	Dial Panel
240	2602-007114	Tuning Shaft
242	2611-7157	Dial Drum
258	2612-7001	Pulley, Dial Cord
	ELECTRICAL	
T1	5584-701309	Power Transformer
SW1	4431-01017358	Push Switch, Power
SW2	4431-01027294	Push Switch, Muting
SW401, 402	4431-02047551	2-Gang Push Switch, Speakers 1, Speakers 2
FU1	5732-402031	Fuse, 4A 125V
FH1	4472-0125	Fuse Holder, FU1
P1	4161-0487	AC Line Cord
TE1	4214-102	FM/AM External Antenna Terminal
TE2, 3	4484-26	4-Pin Jack, Phono, Aux., Tape In, Tape Out
TE4, 5	4214-7034	Speaker Output Terminal, Speaker System 1 & 2
SO1	4474-108	External AC Socket, Switched
J1	4451-0085	Headphones Jack
PL1, 2	5731-1507245	Lamp, 15V 100mA Dial Illuminator
PL3	5731-1207149	Lamp, 12V 60mA Dial Pointer Indicator
L101	5995-703027	Coil, FM RF Balun
L251	5911-211	AM Ferrite Bar Antenna
L401, 402	5991-7125	Coil, RF Choke
D9	5637-GL9PR20	Light Emitting Diode, GL9PR20 Power
D31	5637-TLR206	Light Emitting Diode, TLR206 Monitor Indicator
	1397-6	T-Type Feeder Antenna

DIAL CORD STRINGING



Start stringing with variable capacitor in closed position.

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